The West African Rissoidae (Gastropoda: Rissooidea) and their similarities to some European species

Serge Gofas[1]
Muséum National d'Histoire Naturelle
Laboratoire de Biologie des
Invertébrés marins et Malacologie
55 rue Buffon, F-75005 Paris,
FRANCE

ABSTRACT

The family Rissoidae, which is represented by many species in temperate European and Macaronesian shore and shelf fauna, is found to be also well represented in West Africa. Eighteen species are reported, of which 10 (7 *Alvania*, 2 *Crisilla*, 1 *Zebina*) are here described as new. Only 2 species are shared with the Western European fauna, and all the temperate lineages linked to photophile algae or marine phanerogams (i.e., the genus *Rissoa*, and some lineages in *Alvania*) are missing in West Africa. Four (3 *Alvania* and 1 *Crisilla*) of the shelf species with planktotrophic larvae are closely related to a planktotrophic species of Western Europe, and this is tentatively interpreted as the result of breakup of formerly broader latitudinal ranges.

Key words: Western Africa, new species, species diversity.

INTRODUCTION

The Rissoidae are a prominent part of the littoral, shelf and upper bathyal molluscan faunas in the Mediterranean, temperate Western Europe and in the Atlantic archipelagoes: Canary Islands (Moolenbeek and Faber, 1987; Moolenbeek and Hoenselaar, 1989), Madeira (Watson, 1873), Azores (Dautzenberg, 1889; Gofas, 1990). Pallary (1920) reported twenty species along the coast of Morocco, south of Cape Spartel, but the family is believed to become abruptly impoverished further to the south. Nicklès (1950) stated that there are 6 species in 3 genera for the whole of West Africa. Individual species have later been described (Moolenbeek and Piersma, 1990; Rolán and Fernandes, 1990) but the general perception is still one of very low number of species.

The holdings in the Muséum National d'Histoire Naturelle of Paris (MNHN) include a large number of lots from West Africa, which shows that this perception is essentially a result of low sampling efforts for small continental shelf species in the past. Eighteen species are represented, of which 10 are new and will be described herein, and 4 were described in the last decade.

[1] Current address: Departamento de Biología Animal, Universidad de Málaga, E-29071 Málaga, Spain. sgofas@uma.es

MATERIAL AND METHODS

All the material examined is deposited in MNHN except where otherwise stated. Listings of material examined are arranged from North to South.

The main sources of MNHN material are:

MAURITANIA: shore collecting by P. Bouchet in 1983, and dredgings by R/V "N'Diago" by B. Richer de Forges in 1981;

SENEGAL: collections made by I. Marche-Marchad between 1953 and 1956, mostly by dredging from shore to ca. 250 m depth; some material collected by M. Pin or by K. Leung-Tak since 1980;

IVORY COAST: dredging on the continental shelf by P. Le Loeuff;

ANGOLA: collecting by the author (dredging, shore collecting and snorkling) from 1981 to 1987, jointly with the late F. Fernandes.

The remainder of the West African coast has been very poorly sampled for micromollusks, so that apparent disjunctions in the ranges are not supported by absence in a homogeneous sampling effort.

Some of the Angolan material was sieved in seawater and partly sorted *in situ*, which allowed for preparation of drawings of the living animals. This proved particularly useful for observation of color patterns and delicate structures such as pallial and metapodial tentacles, which Ponder (1985) scored as very informative taxonomic characters. Details about origin of the specimens examined for descriptions of external morphology are given in the "material examined" section of each species.

Specimens were measured with precision of 0.05 mm. Measurements of largest and smallest adult specimens or shells in each lot are given with material examined. Specimens selected for scanning electron microscopy were sonicated, and some washed in a 10% solution of sodium-lauryl sulphate.

Particular attention has been given to protoconchs as taxonomic characters at the species level. Supraspecific classification follows Ponder (1985), except for change

of rank of *Crisilla* from subgenus to genus, following Bouchet and Warén (1993).

List of abbreviations and text conventions:

coll.:	collected by
shell(s):	collected dead
specimen(s):	collected alive
sta.:	station number
AMS:	Australian Museum, Sydney
MNCN:	Museo Nacional de Ciencias Naturales, Madrid
MNHN:	Muséum national d'Histoire naturelle, Paris
UAN:	Universidade Agostinho Neto, Luanda
ZMA:	Zoölogisch Museum, Amsterdam

SYSTEMATICS

Family Rissoidae Gray, 1847
Subfamily Rissoinae Gray, 1847
Genus *Pusillina* Monterosato, 1884

Type species: *Rissoa pusilla* Philippi, 1836, by monotypy (preoccupied by *Rissoa pusilla* Grateloup, 1828, renamed *Rissoa philippi* Aradas and Maggiore, 1844).

Pusillina inconspicua (Alder, 1844)
(Figures 1–8)

Rissoa inconspicua Alder, 1844: 323, pl. 8 figs. 6–7.

Description: Shell conical, adults 1.45×0.95 to 2.75×1.7 mm. Protoconch of 3 rather convex whorls; protoconch 1 less than 1 whorl, smooth; protoconch 2 with a spiral thread running next to the suture on abapical part of whorls, and with very sinuous, indistinct growth lines on last larval whorl. Teleoconch of 2.5 to 3 whorls; spire whorls slightly convex, regularly increasing in size, sculptured with sinuous axial ribs variable in number (10 to 24 on body whorl) and development, and faint spiral cords between these ribs; body whorl with axial ribs interrupted abruptly at periphery, which leaves periumbilical area smooth. Aperture pyriform; Outer lip orthocline, smooth inner surface, thickened externally at some distance from edge by a varix of variable strength developed mostly on adapical part, then thinning out to a cutting edge. Inner lip thin, bordering a narrow umbilicus. Shell color buff, with square blotches abapically along suture; protoconch often tinged with purple or dark brown.

Head-foot with superficial black and yellow pigmentation; black marks on upper midline of propodium and on anterior part of opercular lobes, on more intensely pigmented specimens also on sides of propodium and over posterior part of head. Tentacles cylindrical, with an axial series of yellow blotches; eyes in a small bulge at base of each tentacle. Snout bilobed, with a yellowish buccal mass visible by transparency. Yellow granular masses behind each eye; other more irregular superficial yellow marks on snout, propodium, opercular lobes (behind black area) and sometimes on periphery of foot sole. A deep yellow or orange bar visible by transparency beneath operculum. Single metapodial tentacle rather slender. Sole of foot colorless or with few peripheral yellow marks, with posterior pedal gland apparent around a small longitudinal slit. Right pallial tentacle small, colorless with a yellow blotch at its base; left pallial tentacle not detected, a yellow blotch present at its expected location.

Type locality: Northumberland coast (NE Great Britain), "in deepish waters among corallines".

Material examined: Western Europe: Malaga (Spain), in coarse sand 20–40 m, 100 shells (1.35 × 0.85 to 2.55 × 1.5 mm), coll. Gofas, Sept. 1990; Sagres (Portugal), on coarse sand near cliffs 17–23 m, 11 specimens (1.3 × 0.85 to 1.8 × 1.1 mm), mission Algarve, May 1988; and several hundred specimens from throughout the range. Mauritania: 3 miles W of Kiaoué (20°02′N, 16°22′W), 1 shell (1.85 × 1.25 mm), coll. Marche-Marchad, May 1965; Port Etienne (now Nouadhibou, 20°20′N, 16°22′W), 10 m, 64 shells (1.5×0.95 to 2.25×1.35 mm), coll. Marche-Marchad, May 1965; Baie de l'Etoile, 20 shells (1.8×1.15 to 2.6×1.75 mm), coll. Bouchet, 1983. Senegal (coll. Marche-Marchad except where otherwise noted): Baie de Gorée 10 m, 90 specimens (1.55×0.95 to 2.15×1.4 mm); Baie de Gorée 30 m (1.4×0.9 to 1.9×1.25 mm); Baie de Gorée 33–34 m, 6 shells; Off Gorée, sta. 55–6–7A, 145–170 m, 3 shells; Baie de Gorée 25 m, S. of "Tacoma" shipwreck, 9 shells (1.50×0.95 to 2.00×1.20 mm); South of Gorée 110–112 m, 16 shells (1.4×0.9 to 2.3×1.75 mm); Dakar area 97–98 m, 30 shells (1.55×1.05 to 1.8×1.2 mm); Dakar area, 7 shells (2.15×1.35 to 2.45×1.5 mm); Dakar area 78 m, sta. 55–6–3D (14°19′N, 17°23′W), 5 shells (1.75×1.15 to 1.9×1.5 mm); SW of Cap Manuel 250 m, 1 shell (1.9×1.3 mm); Cap de Naze, in stomach of *Aluteus punctatus*, 2 specimens (2.25×1.45 to 2.35×1.45 mm); Off Saloum, sta. 55–3–9B, 80 shells (1.4×0.9 to 1.85×1.25); Off Saloum, 40 shells (1.5×0.95 to 2.4×1.4 mm); Saloum, mangroves, sta. 8, 25 specimens (2.0×1.0 to 2.75×1.7 mm), coll. Bouchet, 1973. Gabon: Conga, Bay of Corisco, 32 shells (1.4×0.95 to 2.15×1.2 mm). Congo: Pointe Noire (Plage Mondaine), 4 shells, coll. von Cosel, 1985. Angola (coll. Gofas): Ambrizete lighthouse, 25 shells; S. of Ambrizete, Bango, 90 shells; Barra do Dande, 13 shells (1.25×0.85 to 1.6×0.95 mm); Praia São Tiago, 3 shells; Cacuaco intertidal; 3 specimens and 13 shells; Cacuaco 5–10 m, 2 specimens and 3 shells; Etambar, rocks near beach, 18 specimens and 20 shells; Corimba, 20 m on bioclastic gravel, 5 specimens and 400 shells (1.25×0.9 to 2.05×1.3 mm; living animal observed and drawn); Bay of Mussulo km 17, on algae at low tide, 120 specimens (1.45×1.05 to 1.95×1.35 mm); Bay of Mussulo km 31, 15 specimens (living animal observed and drawn); Off Mussulo 90 m, 16 shells (subfossil). Off Mussulo 120 m, 50 shells (subfossil); Cape Palmeirinhas (Buraco) on rocks 2 m, 2 specimens (living animal observed and drawn); Santo Antonio near Benguela 4

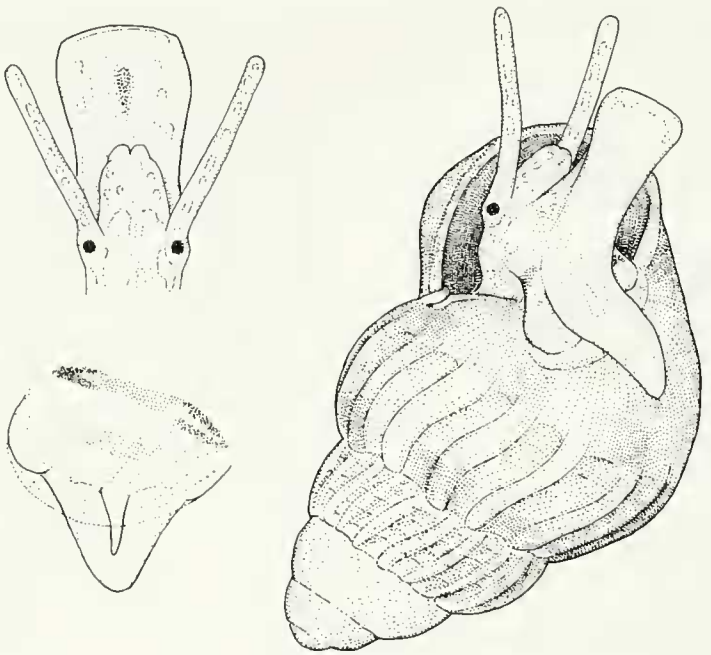


Figure 1. *Pusillina inconspicua* (Alder, 1844). Living animal from off Corimba (Angola), shell length 1.7 mm.

shells; Lucira (Sta Marta) 40 m, 1 shell; Lucira (Bissonga) on gravel of coralline algae, 2 shells; Chapéu Armado, 1 specimen and 3 shells (living animal observed and drawn); São Nicolau, 5 shells; Praia Amelia, intertidal, 1 shell.

Habitat: Most common on subtidal bioclastic coarse sands or gravels, in 10–60 m depth. Also on littoral algae from shore to sublittoral sites, and on deeper muddy bottoms on the continental shelf.

Distribution: From northern Norway to Angola, and the Mediterranean. Unverified record from the Azores (Nordsieck, 1972).

Remarks: This species is characterized by a multispiral protoconch (see Warén, 1996: 1042) with a small protoconch 1 of less than 1 whorl, and a protoconch 2 of slightly more than 2 whorls, suggesting that a long planktotrophic stage is present. Nevertheless, the protoconch/teleoconch transition is usually extremely difficult to detect, even under scanning electron microscopy. It is indicated by a change over less than 1/4 of a whorl, from the extremely sinuous growth lines that correspond to the notches that accommodate the velar lobes of the larva, to nearly axial growth lines formed after the velum is lost.

The range of bathymetric, geographic and morphological variation among West African *Pusillina* suggests that more than 1 species may be present. Individuals vary in shell morphology and color pattern (ribs strong to fine to nearly absent; apex tinged or not with purple, subopercular bar orange or yellow, yellow spots extending or not onto the tentacles and foot). The habitat range is also too broad for what is usual in a single species: in algal wash in the lagoon of Bay of Mussulo, but also on muddy bottoms on the outer part of the continental shelf. Nevertheless, there are no stable combinations of characters and thus no convincing grounds for recognition of more than 1 species at any particular site. Members of the population found in lagoonal environments of Mussulo have multispiral protoconchs and do not differ in this respect from open sea populations. Thus, there is no differentiation comparable to that of the European *Pusillina lincolata* (Michaud, 1832) and *P. inconspicua,* the former clearly separated from the latter by 1 less protoconch whorl.

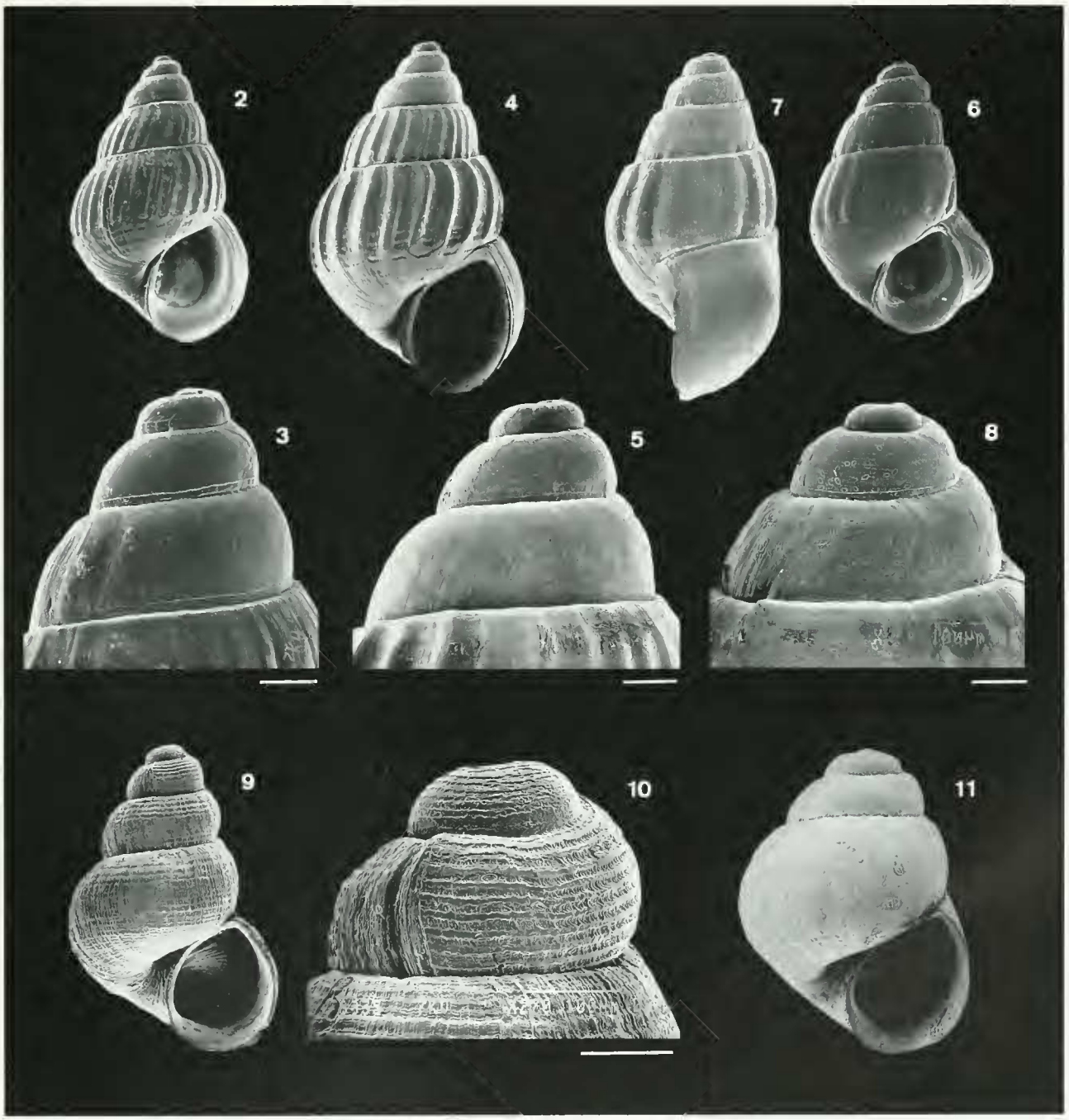
Genus *Setia* H. and A. Adams, 1852

Type species: *Rissoa pulcherrima* Jeffreys, 1848, subsequent designation by Kobelt (1878).

Setia nomca Moolenbeek and Piersma, 1990
(Figures 9–10)

Setia nomca Moolenbeek and Piersma, 1990: 31–33, figs. 1–4.

Description: Shell conical, adults 1.25×0.85 to 1.55×0.95 mm. Protoconch of 1.3 to 1.5 whorls, regularly convex, with 9–10 strong spiral cords. Teleoconch of 2.5 whorls; spire whorls very convex, regularly increasing in size, sculptured with faint, uneven spiral cords (9–12 on penultimate whorl); body whorl rounded with spiral lines continued all over. Aperture rounded, continuous; Outer lip orthocline, smooth inner surface, hardly thickened externally. Inner lip thin, bordering a narrow umbilicus. Shell color buff, with 2 interrupted, very slightly darker bands running along adapical and ab-



Figures 2–8. *Pusillina inconspicua* (Alder, 1844). **2.** Specimen from Sagres (Portugal), shell length 1.65 mm. **3.** Protoconch of the same specimen. Scale bar = 100 μm. **4.** Specimen from off Saloum (Senegal), shell length 2.1 mm. **5.** Protoconch of the same specimen. Scale bar = 100 μm. **6–7.** Specimens from Bay of Mussulo (Angola), shell lengths 1.6 and 2.1 mm. **8.** Protoconch of the specimen in fig. 7. Scale bar = 100 μm.
Figures 9–10. *Setia nomea* Moolenbeek and Piersma, 1990. **9.** Specimen from Baie de l'Etoile (Mauritanie), shell length 1.3 mm. **10.** Protoconch of another specimen from the same locality. Scale bar = 100 μm.
Figure 11. *Obtusella intersecta* (Wood, 1857). Specimen from off Ilha de Luanda (Angola), shell length 0.9 mm.

apical 1/3 of the spire whorls, and a third band on periumbilical area of body whorl.

Type material (not seen): Holotype ZMA Moll. n° 3.89.018 and 68 paratypes from type locality.

Type locality: Serini (Mauritania, 19°34′N, 16°25′W), low tide level.

Material examined: Mauritania: Baie de l'Etoile, in

tertidal, ca. 400 specimens (1.15×0.85 to 1.55×0.95 mm), coll. P. Bouchet 1983.

Habitat: On large tidal flats.

Distribution: This species is known only from a small stretch of the Mauritania coast.

Remarks: The generic allocation is not fully supported but the species is herein treated in its original binominal combination until characters of soft parts are made available. The general shape of the shell, presence of spiral sculpture, and intertidal habitat are typical of *Rudolphosetia* Monterosato, 1917 (type species *Truncatella fusca* Philippi, 1836; subsequent designation by Kobelt, 1878), a taxon which Ponder (1985) placed in the synonymy of *Setia*. Protoconch sculpture with strong spiral cords is a character shared with other species currently placed in *Alvania* (e.g., *Alvania parvula* Jeffreys, illustrated in Gofas and Warén, 1982; *Alvania watsoni* (Watson), Ponder, 1985, p. 151 fig. 102D); *Setia pulcherrima* does have spiral microsculpture on the protoconch, but one of very fine threads that look separated from the surface (Ponder, 1985, p. 134 fig. 85G; Gofas, 1990, fig. 33). The teleoconch sculpture is also shared with some species of *Alvania* (e.g., *A. parvula*, *A. punctura*) and not with *Setia pulcherrima*, which shows only growth lines.

Genus *Alvania* Risso, 1826

Type species: *Alvania europaea* Risso, 1826, subsequent designation by Nevill, 1885.

Alvania africana new species
(Figures 12–19)

Description: Shell high conical, slightly cyrtoconoid, solid, adults 1.9×0.95 mm to 3.0×1.6 mm. Protoconch of 2.2 to 2.3 convex whorls, regularly conical; surface of larval whorls (except for narrow subsutural band) with spiral lines of small granules, which merge into 3–4 continuous threads on abapical part of last larval whorl. Teleoconch of 2.3 to 4.3 whorls; spire whorls convex, with strong, widely spaced axial folds (ca. 15–25 on penultimate whorl) superimposed by strong spiral cords; 2 cords on first teleoconch whorl, 5 (rarely 4) on penultimate whorl; increasing in strength from subsutural cord to abapical one, this latter overhanging adjacent suture. Body whorl rounded, slightly constricted, with 9–10 spiral cords and axial folds gradually fading toward periumbilical area. Outer lip opisthocline, externally thickened by very strong rim strongly differentiated from adjacent external shell surface, then thinning out into delicate edge; superimposed by spiral cords that continue onto edge of lip; internally with 7–8 strong denticles. Inner lip slightly thickened, appressed on imperforate columella.

Shell color tawny with 2 broad, blurry reddish brown bands on body whorl, one subsutural and another on abapical part of body whorl; bands better defined inside aperture where they terminate at edge of outer lip. Columella generally tinged with same reddish brown; some specimens entirely reddish brown, others pale and lacking bands.

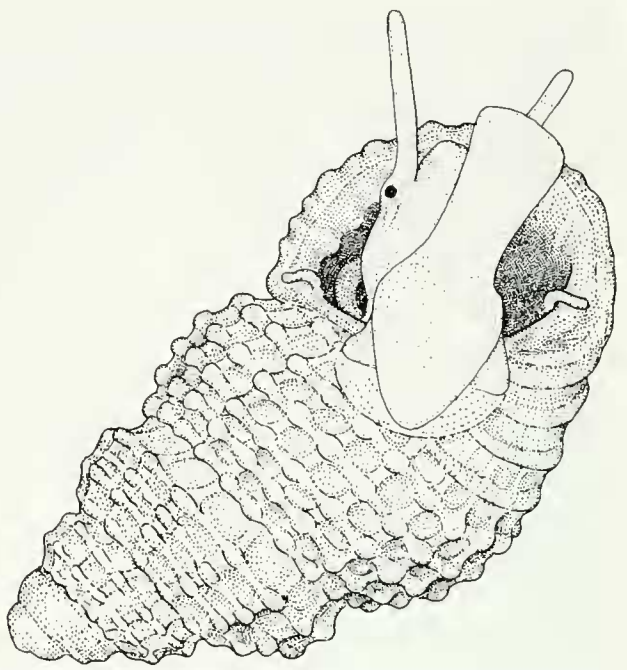


Figure 12. *Alvania africana* new species. Living animal (paratype) from off Ilha de Luanda (Angola), shell length 2.3 mm.

Head-foot colorless except for yellowish granular masses behind each eye, and faint brownish hue at tip of snout. Tentacles parallel sided, eyes in small bulge at base of each tentacle. Snout markedly bilobed, with pink buccal mass visible by transparency. Three metapodial tentacles, rather small and short, clustered tightly. Sole of foot colorless, with pedal gland inconspicuous. Right and left pallial tentacles rather conspicuous, with parallel sides, colorless.

Type material: Holotype (specimen 2.3×1.3 mm) and paratype (specimen 2.3×1.3 mm; living animal observed and drawn) from type locality (MNHN). Paratypes (9 specimens 2.3×1.2 to 2.9×1.45 mm; living animal observed and drawn) from off Ilha de Luanda, 40–60 m (MNHN). Paratypes (2 specimens 2.35×1.25 to 2.7×1.45 mm and 10 shells 1.9×1 to 2.7×1.4 mm) from off Mussulo, 90–100 m (AMS). Paratypes (2 specimens 2.4×1.3 to 2.45×2.6 mm and 10 shells 2.0×1.2 to 2.75×1.45 mm) from off Mussulo, 90–100 m (UAN).

Type locality: Off Ilha de Luanda, Angola, shell gravel, 75–80 m.

Material examined: Mauritania (coll. Richer de Forges): "Ndiago" sta. 317 (19°12′N, 16°40′W), 47 m, 1 shell (apex broken); "N'Diago" sta. 321 (19°18′N, 16°47′W), 40 m, 1 shell. Senegal (coll. Marche-Marchad): Off Saloum, 50 m, 4 shells (2.35×1.2 to 3.15×1.5 mm); Baie de Gorée, 1 shell (1.9×0.95 mm); Off Gorée

50 m, sta. 55–7–5A, 1 shell (2.35×1.25); Off Gorée 95 m,1 shell (2.1×1.05 mm). Cape Verde Islands: Porto Inglés, Maio island, "Sylvana" sta 136, 1 shell (listed as *A. cancellata* by Lamy, 1923). Angola (coll. Gofas): Type material and off Ambrizete 45 m, 40 shells, (1.9×0.95 to 2.75×1.4 mm); Off Ambrizete 80 m, 60 shells (2.05×0.95 to 2.7×1.25 mm); Off Ilha de Luanda 40–60 m, 50 shells (2.2×1.2 to 2.9×1.45 mm); Corimba 10–20 m, 5 specimens (2.75×1.5 to 3.0×1.6 mm); Off Mussulo 90–100 m, from fishermen, 3 specimens and 50 shells (2.35×1.25 to 2.75×1.45 mm); Cabo Ledo 40 m, 1 specimen (2.85×1.45 mm); Santa Maria 8–10 m, 1 specimen (3.0×1.5 mm); Bay of Lucira (Cesar) 10 m in maerl, 5 shells (2.35×1.25 to 2.95×1.55 mm); Santa Marta 40 m, 6 shells (2.35×1.2 to 3.0×1.55 mm); Praia Amélia 40–60 m, 200 shells (2.15×1.2 to 2.65×1.45 mm); Porto Alexandre, 2 specimens (2.25×1.3 mm; living animal observed and drawn).

Habitat: On hard bottoms of rocks, coarse shell gravel or (in Santa Maria and Lucira, Province of Benguela, Angola), concretions of calcareous algae, 10–60 m.

Distribution: Mauritania and Senegal; northern and southern Angola. The record from Cape Verde Islands needs confirmation.

Remarks: This species mostly resembles the European species *Alvania beani* (Hanley, 1844), having same general outline, type of teleoconch sculpture, multispiral protoconch, and colorless animal. The main differences are: (1) the protoconch is broader, with flatter spire angle, the spiral cords near abapical suture of last protoconch whorl are stronger, (2) teleoconch in average seems to be more slender, (3) the suprasutural cord on all spire whorls is overhangs the suture more conspicuously (juveniles look somewhat carinate), and (4) adults are smaller. The 2 species are not sympatric, but *A. beani* is present with a apparently consistent range of variation from the British isles to southern Morocco, then separated by ca. 1000 km from the known West African range of *A. africana.*

Alvania marioi new species
(Figures 20–24)

Description: Shell high conical, solid, adults 1.9×1.2 mm to 3.15×1.9 mm. Protoconch of 2.2 to 2.5 convex whorls, regularly conical; surface of larval whorls (except a narrow subsutural band) with spiral lines of small granules, which merge into 3–4 quite continuous threads on abapical part of last larval whorl; latter sometimes broken into slightly oblique segments arranged along spiral line. Teleoconch of 2.7 to 3.9 whorls; spire whorls convex, with strong, widely spaced axial folds (ca. 16–20 on penultimate whorl) and strong spiral cords; intersections spinose; 2 cords on first teleoconch whorl, 3 cords of equal size on penultimate whorl; adapical cord at some distance from suture forming shouldered whorl. Body whorl rounded, with 9–10 strong spiral cords and axial folds gradually fading toward periumbilical area where they are only expressed as beads on spiral cords. Outer lip slightly opisthocline, externally thickened by strong rim strongly differentiated from adjacent external shell surface, then thinning out into delicate edge; superimposed by spiral cords that continue without fading onto edge of lip; internally with 6–7 denticles. Inner lip slightly thickened, appressed on imperforate columella.

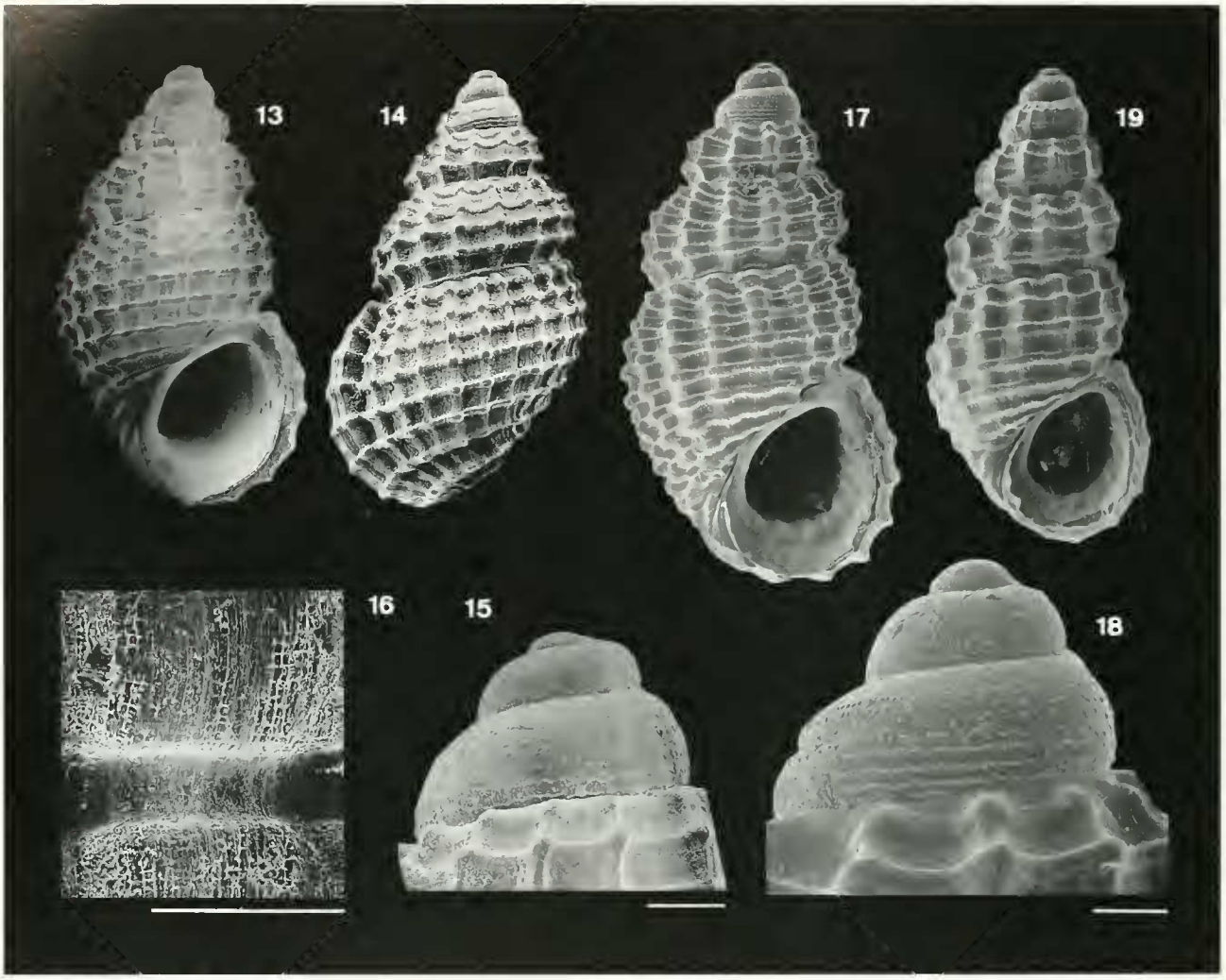
Shell color whitish, with extremely tenuous brownish tinge sometimes on body whorl adjacent to apertural rim; commonly incrusted with rusty stains on living specimens.

Head-foot colorless, with elongate opaque white granular masses behind each eye, and faint brownish hue at tip of snout. Tentacles parallel sided, slender; eyes in small bulge at base of each tentacle. Snout markedly bilobed, with pink buccal mass visible by transparency. (No notes on metapodial tentacles). Sole of foot colorless, with pedal gland inconspicuous. Right and left pallial tentacles rather conspicuous, with parallel sides, colorless.

Type material: Holotype (specimen 2.75×1.6 mm) and 5 paratypes (shell 2.5×1.55 to 2.8×1.65 mm) from the type locality (MNHN). Paratype (specimen 2.7×1.65 mm, living animal observed and drawn) from off Ilha de Luanda, 75–80 m (MNHN). Paratypes (10 shells 2.0×1.3 to 2.75×1.65 mm) from off Mussulo 90–100 m (AMS). Paratypes (10 shells 2.25×1.1.45 to 2.75×1.7 mm) from off Mussulo, 90–100 m (UAN).

Type locality: Off Ilha de Luanda (Angola), shell gravel, 40–60 m.

Material examined: Mauritania: "Ndiago" sta. 316 (19°12′N, 16°37′W), 34 m, 1 specimen. coll. Richer de Forges 1981. Senegal (coll. Marche-Marchad unless otherwise noted): Baie de Gorée 12 m, 3 specimens (2.5×1.5 to 2.8×1.7 mm), coll. Bouchet; SW of Madeleines 455 m, 1 shell (2.25×1.4 mm); SW of Gorée 150–250 m, 2 juvenile shells; Baie de Gorée, S. of "Tacoma" shipwreck, 25 m, 4 shells (1.6×1.1 to 2.2×1.4 mm); Baie de Gorée 30 m, 1 juvenile shell ; SW of Madeleines 50 m, 3 shells (2.4×1.4 to 2.6×1.5 mm); Off Saloum 50 m, 18 shells (2.1×1.3 to 2.55×1.5 mm). Ivory Coast: "Rafale" sta. 6 (5°01.5′N, 3°23.5′W), 70 m, 1 shell and 2 fragments. Angola (coll. Gofas unless otherwise noted): Type material and off Ambrizete 45 m, 5 shells (2.75×1.6 mm to 2.9×1.65 mm); Off Ambrizete 80 m, 15 shells (1.9×1.25 to 2.65×1.6 mm); Off Corimba 10–20 m, 10 shells (2.7×1.7 to 3.15×1.9 mm); Off Ilha de Luanda 40–60 m, 40 shells (2×1.2 to 2.8×1.6 mm); Off Ilha de Luanda 120 m, 14 shells (2.25×1.4 to 2.7×1.7 mm); Off Mussulo 90–100 m, from fishermen, 60 shells (2.25×1.4 to 2.9×1.75 mm); Santa Maria 5–10 m, 1 shell (3.25×1.85 mm); Santa Marta 40 m, 10 shells (2.6×1.6 to 2.9×1.95 mm); São Nicolau, shore, 22 shells (2.3×1.5 to 3.0×1.85 mm); Off Praia Amelia 40–60 m, 16 specimens + 85 shells (2.7×1.5 to 3.1×1.8 mm); Off Praia Amelia, dredged 15–35 m, 5 juvenile and 1 adult



Figures 13–19. *Alvania africana* new species, from Angola. **13–14.** Holotype, from off Ilha de Luanda, shell length 2.3 mm. **15.** Protoconch of the holotype. Scale bar = 100 μm. **16.** Detail on a teleoconch whorl of the holotype, showing the reticulate pattern of the periostracum. Scale bar = 100 μm. **17.** Specimen from off Corimba, shell length 2.75 mm. **18.** Protoconch of the same specimen Scale bar = 100 μm. **19.** Shell from off Ambrizete, shell length 2.3 mm

shell (2.0×1.2 mm), coll. Mission Gruvel May 1910 (Dautzenberg collection, Institut Royal des Sciences Naturelles, Bruxelles; identified by Dautzenberg as *Alvania cancellata* (da Costa, 1778)).

Habitat: On hard bottoms of rocks, coarse shell gravel or (in the province of Benguela), concretions of calcareous algae, 10–60 m; often found with *A. africana*.

Distribution: Mauritania and Senegal; Ivory Coast; northern and southern Angola.

Etymology: This species is named after Mario Albano dos Santos, a friend from Moçâmedes, who owns there a crab fishery and has hosted many of the collecting trips to Southern Angola.

Remarks: This species resembles *Alvania cancellata* (da Costa, 1778) with which it shares coarse sculpture and strong nodes on outer lip at the end of the abapical spiral cords. It is distinguished by being smaller and more slender and having a different construction of the most abapical cord (the one running next to columella) of body whorl, narrow and beaded in *A. marioi*, and only a massive concretion in *A. cancellata*.

The citation by Dautzenberg (1913) of *A. cancellata* is based on specimens of *A. marioi* (material examined at IRSN, Brussels). Nicklès (1950) figured true *A. cancellata* (presumably a specimen of European origin) but included the species in his guide on the basis of "being found in Angola" (i.e., based on the record by Dautzenberg, 1913, as no further data on Angola were available in 1950).

Alvania venus (d'Orbigny, 1852), a well known fossil species from the Miocene of Aquitaine Basin, SW France, resembles *A. marioi*, with which it shares the out-

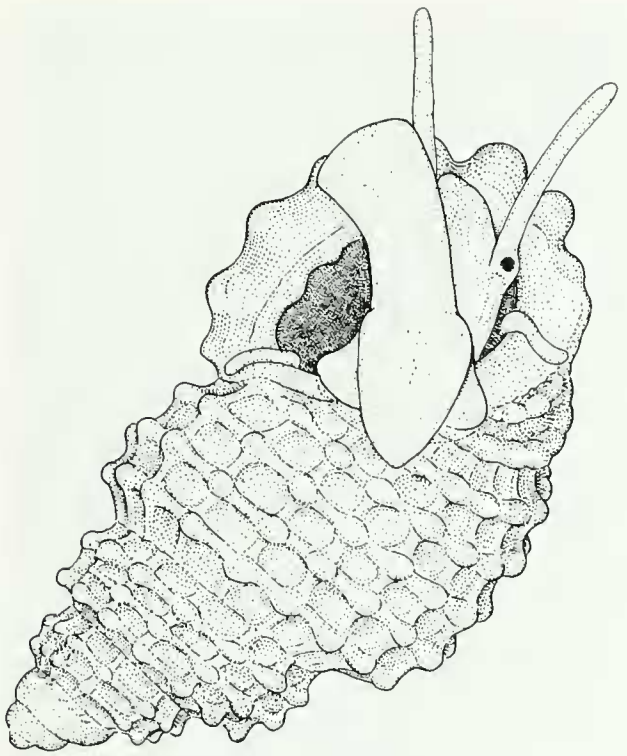


Figure 20. *Alvania marioi* new species. Living animal (paratype) from off Ilha de Luanda (Angola), shell length 2.7 mm.

line and size, the kind of sculpture and the shouldered whorls with a cord at some distance from the suture. It is nevertheless distinguished by having a third cord appearing on early teleoconch whorls.

This species may be confused with the Mediterranean *A. hispidula* Monterosato, 1884 (figures 25–26), with which it shares similar proportions, pattern of reticulation, and protoconch. One of the consistent differences resides in the architecture of the subsutural area, shouldered in *A. marioi*, with a strong cord at some distance from the suture; sloping, with a small subsutural cord in *A. hispidula*. The abapical part of the body whorl is also produced differently: 2 sharp, neatly beaded cords separated by a deep depression and terminating with marked indentations on the outer lip and then a simple cord along the umbilical chink in *A. marioi*; in *A. hispidula* the 2 cords are more roughly, irregularly beaded, not so sharp, and weakly marked over the outer lip; the last small cords along the umbilical chink tend to be duplicated. The relationships of *A. hispidula* to coarse forms ("*A. calathus* Forbes and Hanley") of the *A. beani* complex have yet to be documented. *Alvania hirta* (Monterosato, 1884), a species with a restricted distribution in the southeastern part of the Western Mediterranean, resembles this species in the architecture of the subsutural area, and in size and proportions. It differs in having a paucispiral protoconch and only 2 cords on the penultimate whorl.

Alvania flexilis new species
(Figures 27–32)

Description: Shell high conical, cyrtoconoid, moderately solid, adults 1.0×0.7 mm to 2.0×1.2 mm. Protoconch of 2 to 2.2 convex whorls, first one slightly depressed; surface of larval whorls (except for narrow subsutural band) with spiral lines made of closely set or contiguous small granules. Teleoconch of 2 to 3 whorls, with sculpture of thin, sharp, widely spaced spiral cords superimposed on thin, sinuous axial ribs. Spire whorls have 1 cord running along adapical suture, second cord quite close to subsutural one, and suprasutural cord on abapical side, overhanging suture at some distance; spiral cords are poorly developed in between. One or 2 additional spiral cords gradually appear in that interval on penultimate whorl, so that there are about 10 evenly spaced spiral cords on body whorl. Axial ribs very gradually fade out on abapical part of body whorl. Ribs on body whorl 15–30. Outer lip opisthocline, with thin edge and thickened externally at distance of edge by broad rim, superimposed by spiral cords; smooth and not thickened internally. Inner lip thin, bordering tiny umbilical chink.

Shell color tawny with 2 very faint brownish bands, one over the 2 subsutural cords, other approximately at anterior 1/3 of body whorl, ending in a more intense blotch near edge of aperture.

Type material: Holotype (shell 1.6×1.05 mm) and 5 paratypes (shells 1.45×0.95 to 1.85×1.1 mm) from type locality (MNHN). Paratypes (10 shells 1.2×0.75 to 1.9×1.15 mm) from off Mussulo, 90–100 m (AMS). Paratypes (10 shells 1.25×0.8 to 1.95×1.15 mm) from off Mussulo, 90–100 m (UAN).

Type locality: Off Ilha de Luanda (Angola), shell gravel, 40–60 m.

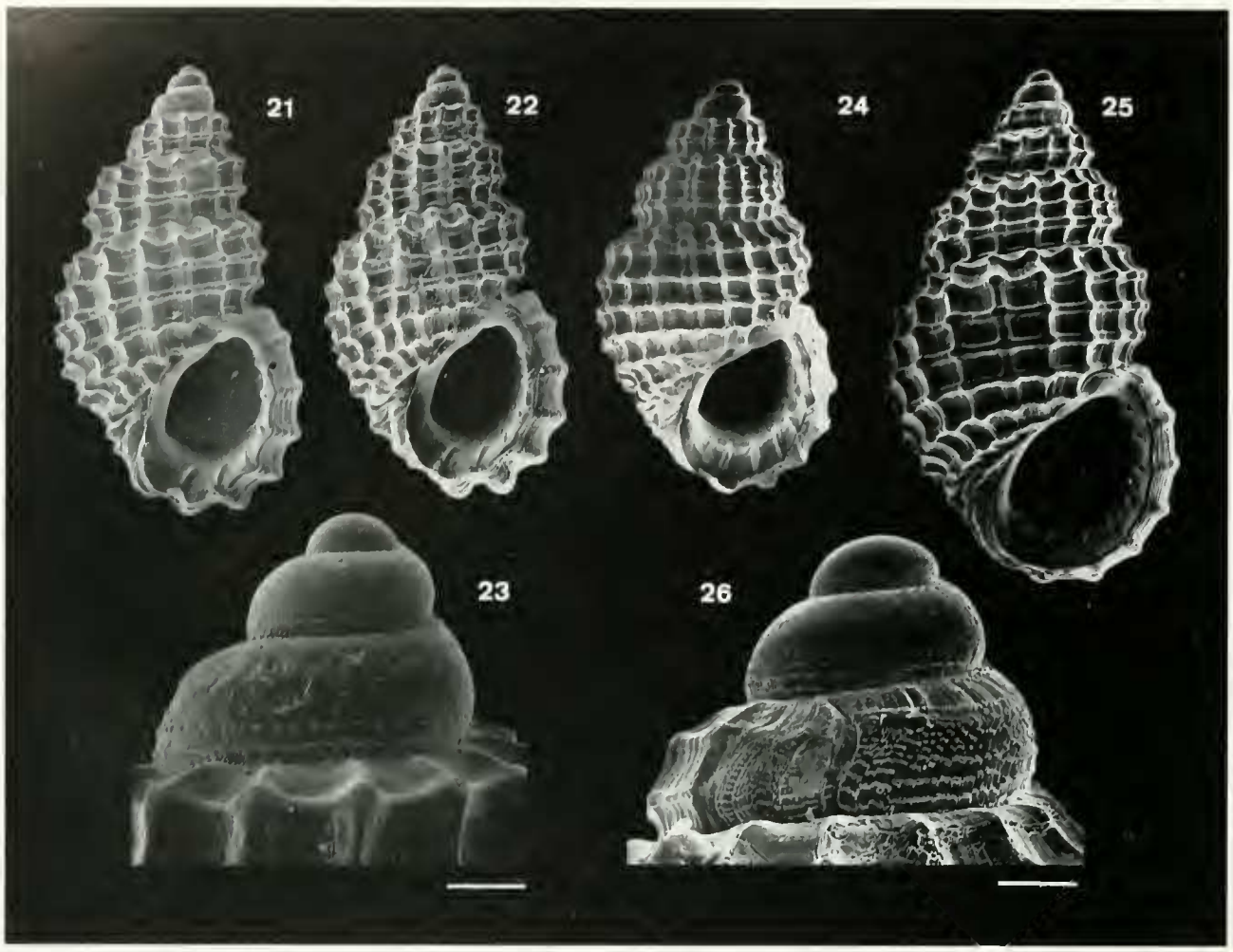
Material examined: Senegal (coll. Marche-Marchad): Off Saloum 50 m, 9 shells (1.05×0.7 to 1.5×0.9 mm); Dakar area 97–98 m, 1 shell (1.6×1 mm). Equatorial Guinea: (1°40′N, 9°25′E), 150 m, 1 shell (1.3×0.8 mm). Angola (coll. Gofas): Type material and off Ambrizete 45 m, 18 shells (1.05×0.7 to 1.35×0.9 mm); Off Ambrizete 80 m, 38 shells (1.05×0.75 to 1.75×1 mm); Off Ilha de Luanda 40–60 m, 20 shells (0.95×0.7 to 1.85×1.1 mm); Off Ilha de Luanda120 m, 40 shells (1.55×0.9 to1.05×0.65 mm); Off Mussulo 90–100 m, 80 shells (1.1×0.75 to 2.0×1.2 mm) ; Praia Amelia 40–60 m, 4 shells (1.4×0.9 to 1.6×1.0 mm); Off Ponta Albina 40 m, 1 shell (1.2×0.75 mm).

Habitat: On muddy bottoms of outer shelf.

Distribution: Mauritania and Senegal; Gulf of Guinea; Northern and Southern Angola.

Etymology: The specific name alludes to the shell sculpture with sinuous axial ribs.

Remarks: This species somewhat resembles the European species *Alvania testae* (Aradas and Maggiore



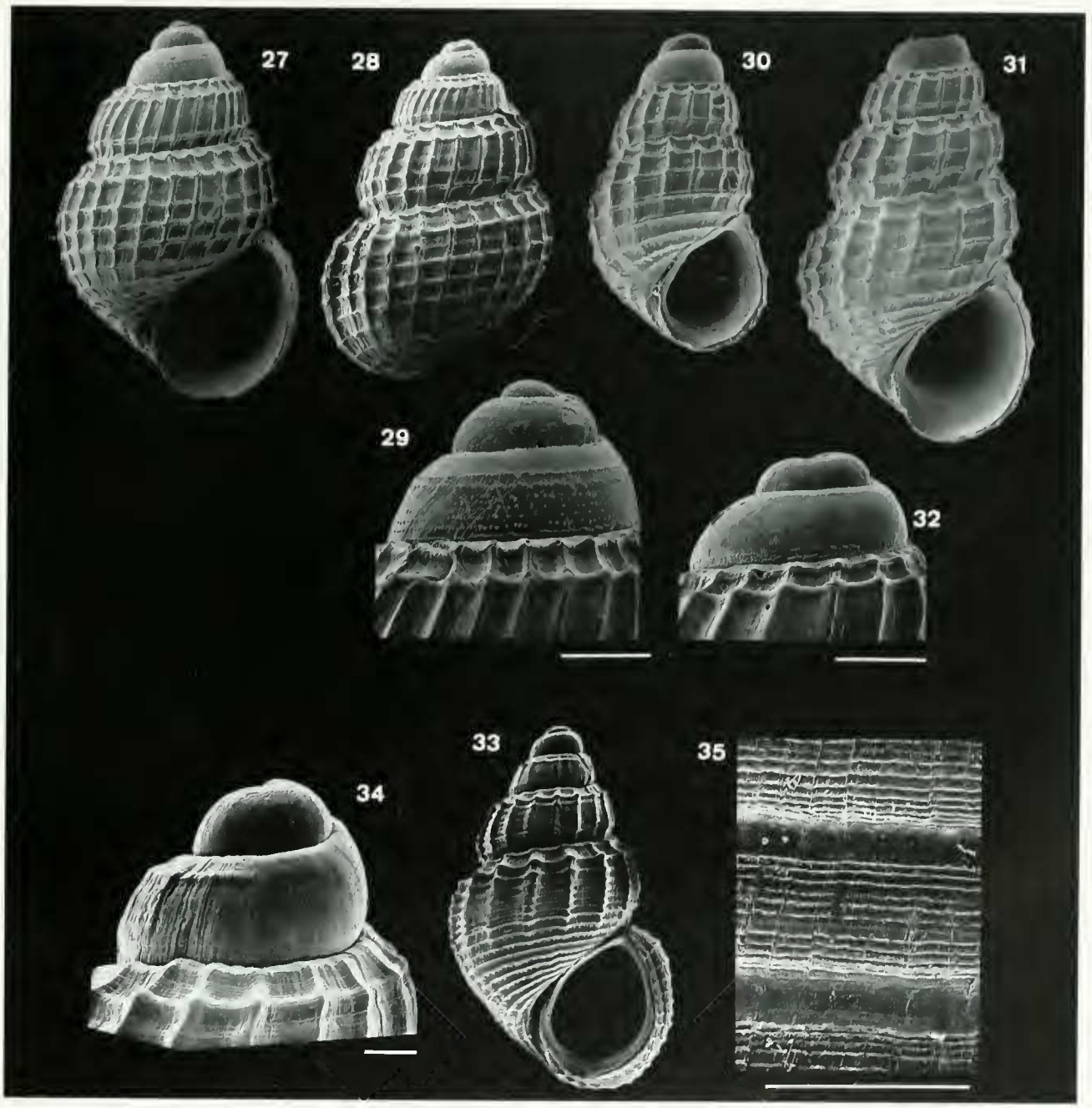
Figures 21–24. *Alvania marioi* new species. **21.** Shell from off Ambrizete (Angola), shell length 2.9 mm. **22.** Holotype, from off Ilha de Luanda (Angola), shell length 2.75 mm. **23.** Protoconch of the holotype Scale bar = 100 μm. **24.** Specimen from off Saloum (Senegal), shell length 2.5 mm.
Figures 25–26. *Alvania hispidula* Monterosato, 1884. **25.** Specimen from off San Vito (Sicily), coll. Monterosato, shell length 3.25 mm. **26.** Protoconch of the same specimen Scale bar = 100 μm.

1844) because of its sinuous ribs and very opisthocline outer lip. It also occupies a similar habitat on muddy offshore bottoms. It differs in having (1) thinner and smaller shell, and (2) larger protoconch that forms a more obtuse apical angle, lacking oblique threads on adapical part of the whorls (see Bouchet and Warén, 1993: fig. 1387, for an illustration of the protoconch of *A. testae*).

The Miocene fossil species *Alvania raulini* Cossmann and Peyrot, 1918, from the Aquitaine Basin, is very similar is size, general outline, and habitat on the muddy outer shelf. It shares with *A. flexilis* the teleoconch sculpture with 2 stronger spiral cords, respectively adapically and abapically from the suture. The protoconch is nevertheless much smaller, with 1 less whorl.

Alvania regina new species
(Figures 33–35)

Description: Shell high conical, solid, adults 2.05×1.35 mm to 2.7×1.6 mm. Protoconch with 1.4–1.5 convex whorls, globose; whorls apparently smooth, with minute and scarce granules visible only under high magnification (scanning electron microscopy). Teleoconch with 2.9–3.2 whorls; spire whorls convex, with sinuous axial folds (ca. 18–22 on penultimate whorl) and spiral cords much narrower than interspaces; intersections blunt; most cords indistinct on first teleoconch whorl, except for 1 subsutural and 1 suprasutural which will remain stronger throughout subsequent whorls; adapical one quite separated from suture. Penultimate whorl with 6–7 spiral cords. Body whorl rounded, with 16–18 spiral cords and folds gradually fading towards periumbilical area; subsutural cord stronger, others equal in size. Fine microsculpture of spiral threads on teleoconch whorls. Outer lip slightly opisthocline, externally thickened by strong rim that is strongly differentiated from adjacent external shell surface; superimposed by spiral cords which continue, very attenuated, on its outer surface; inner surface smooth. Inner lip



Figures 27–32. *Alvania flexilis* new species, from Angola. **27–28.** Shell (holotype) from off Ilha de Luanda, shell length 1.6 mm. **29.** Protoconch of the holotype. Scale bar = 100 μm. **30–31.** Shells from off Ambrizete, shell length 1.3 and 1.8 mm. **32.** Protoconch of the specimen fig. 31. Scale bar = 100 μm.
Figures 33–35. *Alvania regina* new species, from Senegal. **33.** Shell (holotype) from off SW of Cap Manuel, 250 m, shell length 2.7 mm. **34.** Protoconch of the holotype. Scale bar = 100 μm. **35.** Detail of the microsculpture on a teleoconch whorl of the holotype. Scale bar = 100 μm.

slightly thickened, leaving a distinct umbilical chink. Shell white.

Type material: Holotype (shell 2.7×1.6 mm) and 5 paratypes (shells 2.05×1.35 to 2.45×1.55 mm) from type locality, coll. Marche-Marchad (MNHN).

Type locality: SW of Cap Manuel (Senegal), 250 m.

Habitat: On muddy bottoms of upper slope.

Distribution: Known only from type locality.

Etymology: The specific name alludes to the pattern of subsutural knobs, which resemble a queen's crown.

Remarks: This species shares with *A. flexilis* the sculp

ture of sinuous, sharp axial ribs, spiral cords that become stronger abapically from suture, and outer lip smooth internally. It is clearly differentiated by its larger size, outer lip thickened externally, spiral microsculpture, and protoconch with 1 less whorl. It does not resemble any of the known Western European species.

Alvania gofasi (Rolán and Fernandes, 1990)
(Figures 36–39)

Manzonia gofasi Rolán and Fernandes, 1990, p. 63–64, pl. 1, figs. 1–3.

Description: Shell high conical, solid, adults 1.5×1 mm to 2.1×1.3 mm. Protoconch with 2 convex whorls, first one slightly flattened on top; surface of larval whorls with pair of spiral lines, formed by slightly oblique segments, at some distance from adapical suture, and cluster of other 2–3 such lines near abapical suture. Teleoconch with 2.2–2.8 whorls; spire whorls very convex, with strong, widely spaced axial folds (ca. 12–14 on penultimate whorl) and strong spiral cords; intersections pointed; 3 cords on all spire whorls; adapical cord situated at some distance from suture forming shoulder. Spiral microsculpture of fine striae (ca. 40 between a pair of cords) visible under SEM, evenly set on cords and interspaces, and superimposed on axial folds. Body whorl rounded, with 6 strong spiral cords and faint seventh cord just bordering umbilical chink; axial folds gradually fading toward periumbilical area; fifth cord separated from sixth one by slightly broader and deeper interspace, sixth cord smooth. Outer lip very slightly opisthocline, externally thickened by very strong rim that is strongly differentiated from adjacent external shell surface, terminating with clearly differentiated flat surface on apertural plane; superimposed externally by spiral cords that terminate abruptly at edge of that surface; inner surface of aperture smooth, clearly differentiated from apertural edge. Inner lip slightly thickened, narrowing towards small umbilical chink.

Shell color whitish, with pale brownish band on middle part of spire whorls and another one on periumbilical area, not continued on aperture.

Type material: Holotype (not seen) in MNCN, Madrid.

Type locality: Off Ilha de Luanda (Angola), 50–100 m.

Material examined: Senegal (coll. Marche-Marchad): Off Gorée 95 m, 1 specimen + 1 shell (1.8×1.2 to 2.1×1.3 mm); SW of Cap Manuel, 2 shells. Angola (coll. Gofas): Ambrizete 45 m, 7 shells (1.45×0.95 to 1.75×1.1 mm); Ambrizete 80 m, 3 shells (1.7×1.05 mm to 1.4×0.9 mm); Off Ilha de Luanda 40–60 m, 9 shells (1.5×0.95 to 2×1.2 mm); Off Ilha de Luanda 120 m, 9 shells (1.75×1.15 mm to 1.45×1 mm); Off Mussulo (Macoco) 50–70 m, 4 shells (1.75×1.15 to 1.9×1.25 mm); Off Mussulo 90–100 m, 2 specimens + 20 shells (1.6×1 mm to 2×1.25 mm).

Habitat: On rocky areas of the outer shelf.

Distribution: Only known from Senegal and from Northern Angola.

Remarks: This species is very similar to the European *A. zetlandica* (Montagu, 1815) and shares with it the sculpture, microsculpture, and the peculiar construction of the aperture with a flat, beveled edge. This latter structure is not present in any other European of West African rissoid and seems unique. I agree with Moolenbeek and Faber (1987) that this species should not be allocated to the genus *Manzonia* Brusina, 1870 (type species by original designation: *Turbo costatus* Adams, 1797 = *T. crassus* Kanmacher, 1798), and that *Manzonia* should include only species having pitted spiral microsculpture.

Alvania fariai (Rolán and Fernandes, 1990)
(Figures 40–42)

Manzonia fariai Rolán and Fernandes, 1990: 64–65, pl. 1 figs. 4–6.

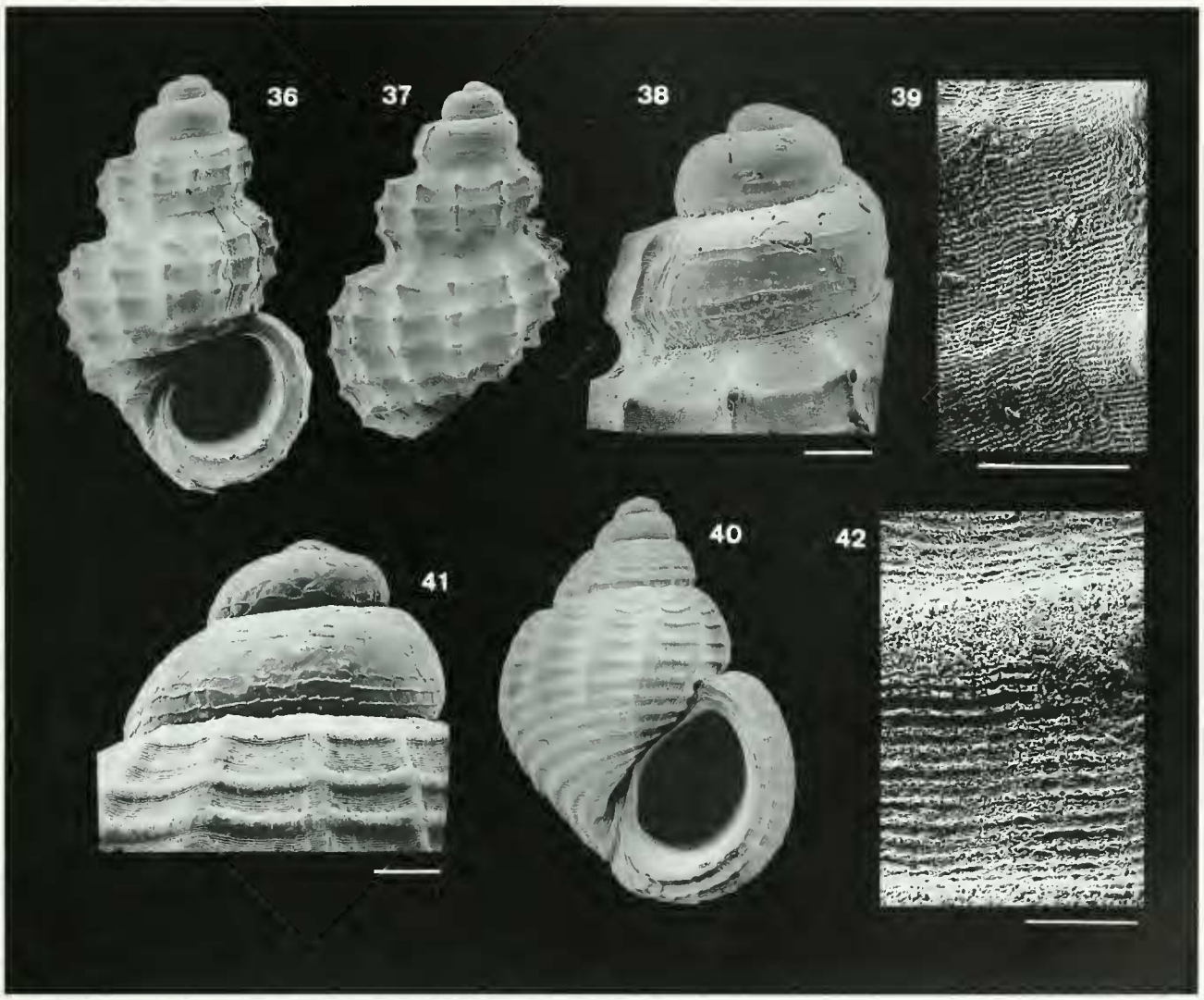
Description: Shell conical, moderately solid, adults 2.15×1.6 mm to 2.55×1.85 mm. Protoconch conical with 2–2.2 convex, laterally compressed whorls; protoconch whorls with 7–8 very fine spiral threads that tend to break into small, slightly oblique segments. Teleoconch with 2.2–2.8 whorls, with sculpture of blunt spiral cords superimposed on broad, sinuous axial ribs; 4 cords on first teleoconch whorl, 5 on penultimate, 12–13 on body whorl. Axial ribs (ca. 15–16 on body whorl) gradually fading on periumbilical area, where spiral cords are broader and flatter. Outer lip very slightly opisthocline and sinuous, thickened externally by prominent rim, raised to form sort of crest in its adapical part; superimposed by spiral cords which terminate abruptly at edge of the inner surface; most abapical spiral cords of body whorl also extending on outer lip; inner surface smooth and not thickened, clearly differentiated from outer surface of apertural rim. Inner lip rather narrow, bordering tiny umbilical chink. Shell color white.

Type material: Holotype (not seen) in MNCN, Madrid.

Type locality: Off Ilha de Luanda (Angola), 100 m.

Material examined: Senegal (coll. Marche-Marchad): SW of Cap Manuel 250 m, 12 shells (2.15×1.65 to 2.55×1.85 mm); SW of Gorée 150–250 m, 1 shell (2.25×1.65 mm). Off Gorée sta. 56-1-10A, 150–200 m, 1 shell (2.5×1.85 mm). Angola (coll. Gofas): Off Ambrizete 60 m, 1 shell + 2 fragments (2.2×1.6 mm); Off Ambrizete 80 m, 5 shells (2.2×1.65 to 2.45×1.75 mm); Off Ilha de Luanda 40–60 m, 1 shell (2.35×1.65 mm); Off Ilha de Luanda 120 m, 3 shells (2.3×1.7 to 2.35×1.7 mm); Off Mussulo (Macoco) 50–70 m, 2 shells (2.25×1.7 to 2.35×1.7 mm).

Habitat: On the outer shelf and upper slope, type of bottom unknown.



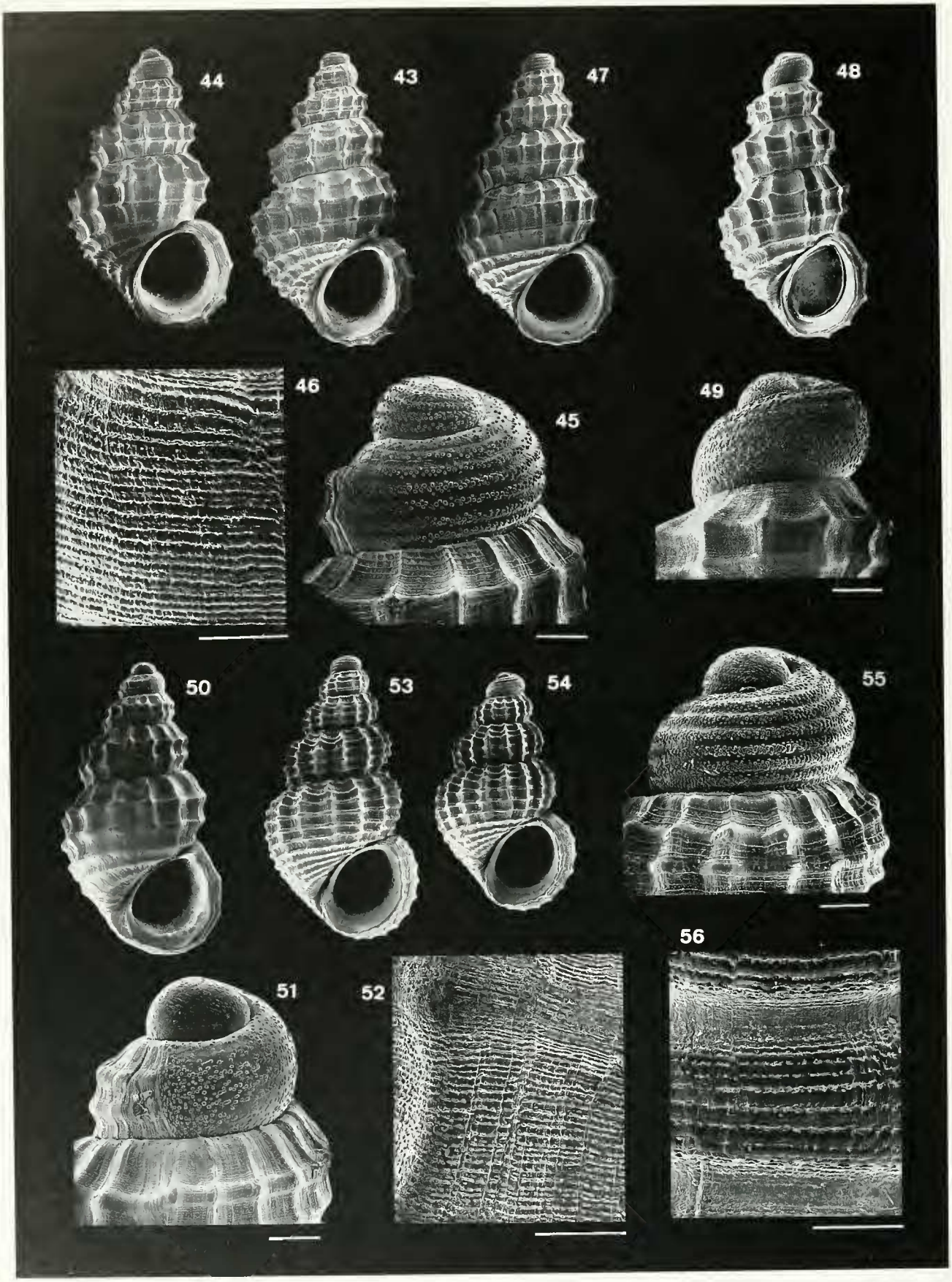
Figures 36–39. *Alvania gofasi* (Rolán and Fernandes, 1990), from Angola. **36–37.** Shells from off Ambrizete, shell length 1.7 mm and 1.55 mm. **38.** Protoconch of the specimen fig. 37. Scale bar = 100 μm. **39.** Detail of the microsculpture on a teleoconch whorl of the same specimen. Scale bar = 50 μm.
Figures 40–42. *Alvania fariai* (Rolán and Fernandes, 1990), from Angola. **40.** Shell from off Ambrizete, shell length 2.2 mm. **41.** Protoconch of the specimen fig. 40. Scale bar = 100 μm. **42.** Detail of the microsculpture on a teleoconch whorl of the same specimen. Scale bar = 20 μm.

Distribution: Senegal and northern Angola.

Remarks: This species is not closely related to any other extant species of the Rissoidae, but resembles an undescribed species from deep-water Oligocene deposits of SW France (Lozouet, pers. comm.), with which it shares the peculiar arrangement of the outer lip and the rather cylindrical protoconch whorls. It does not have the punctate spiral sculpture of *Manzonia*.

Alvania marchadi new species
(Figures 43–47)

Description: Shell high to very high conical, solid, adults 2.25×1.25 mm to 2.95×1.5 mm. Protoconch with 1.3–1.5 convex whorls, globose; with 7 spiral flat cords, as broad as interspaces, formed by minute granules that can be distinguished only under high magnification. Teleoconch with 3.3–4.2 whorls; spire whorls convex, with strong, widely spaced, nearly vertical axial folds (ca. 12–14 on penultimate whorl) and strong spiral cords, narrower than interspaces; intersections pointed; 2 cords on first and second teleoconch whorl, third one inserted between suture and most adapical of preexisting cords on second teleoconch whorl, progressively increasing in strength. Body whorl rounded, with 8 spiral cords and axial folds gradually fading towards periumbilical area; spiral cords most developed near periphery, 2 cords bordering inner lip faint and coalescent. Teleoconch whorls with fine spiral microsculpture of wrinkled threads. Out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er lip slightly opisthocline, externally thickened by very strong rim strongly differentiated from adjacent external shell surface; superimposed by spiral cords that continue, very attenuated, onto edge of lip; inner surface smooth. Inner lip slightly thickened, loosely appressed on columella. Shell color whitish.

Type material: Holotype (shell 2.7×1.4 mm) and 9 paratypes (shells 2.2×1.35 to 2.95×1.45 mm) from type locality, coll. Marche-Marchad, 20 Feb. 1956 (MNHN). Paratypes (3 shells 2.5×1.4 to 3.0×1.55 mm) from type locality (AMS).

Type locality: SW of Cap Manuel, Dakar area (Senegal), 80–250 m.

Material examined: Morocco: Off Sidi Ifni, "Cineca 3" sta. B33 (29°23′N, 10°50′W), 132 m, 34 shells (2.25×1.3 to 2.85×1.45 mm), coll. Glémarec 1972. Mauritania: "Ndiago" sta. 01 (20°18′N, 17°40′W), 185 m, 1 shell (2.5×1.5 mm), coll. Richer de Forges 1981. Senegal (coll. Marche-Marchad): Type material and Dakar area 170–200 m, 1 shell (2.5×1.5 mm); S. of Gorée 110–112 m, 12 shells (2.25×1.25 to 2.75×1.45 mm); Off Gorée 150–200 m, sta. 56-1-10A, 12 shells (2.4×1.35 to 2.9×1.5 mm); Dakar (no details) 1 specimen (2.25×1.25 mm).

Habitat: On deeper part of shelf and upper part of slope, bottom type unknown.

Distribution: From the Saharan coast to Senegal.

Etymology: The species is named after Igor Marche-Marchad, who has collected most of the Senegalese material studied herein and contributed much to the knowledge of West African mollusks.

Remarks: This species resembles the Mediterranean species *A. subareolata* (Monterosato, 1869) (figures 48–49 herein, specimen collected near the type locality). The main differences are that *A. marchadi* is larger, the spiral microsculpture is better defined, there is an additional cord on the broad shoulder of body whorl, the granules on protoconch are more clearly organized to form spiral cords, and it is whitish instead of brown or banded.

The length-width ratio is apparently surprisingly variable, even within the same population, but this is not correlated with any other character, which would suggest presence of more than 1 species.

Alvania richeri new species
(Figures 50–52)

Description: Shell high conical, solid, adults 2.1×1.2 mm to 2.7×1.55 mm. Protoconch with 1.3–1.5 convex whorls, globose; surface of larval whorls with minute granules that can be distinguished only under high magnification; some of them loosely aligned spirally or obliquely. Teleoconch with 3.3–4.0 whorls; spire whorls convex, with widely spaced, nearly vertical axial folds (ca. 15 on penultimate whorl) and spiral cords narrower than interspaces; intersections bluntly pointed; 2 cords on first and second teleoconch whorl, adapical one quite separated from suture; adapical edge of whorls along suture somewhat swollen. Body whorl rounded, with 6 spiral cords and axial folds gradually fading towards periumbilical area; spiral cords near periphery most developed, 2 bordering inner lip quite faint and coalescent. Teleoconch whorls with extremely fine spiral microsculpture of granulose threads. Outer lip slightly opisthocline, externally thickened by very strong rim strongly differentiated from adjacent external shell surface; superimposed by spiral cords that continue, very attenuated, on its outer surface; inner surface smooth. Inner lip slightly thickened, leaving a distinct umbilical chink. Shell color whitish.

Type material: Holotype (shell 2.70×1.45 mm) and 8 paratypes (shells 2.1×1.2 to 2.7×1.45 mm) from the type locality, coll. Marche-Marchad, 20 Feb. 1956. Paratypes (3 shells 2.20×1.25 to 2.7×1.4 mm) from type locality (AMS).

Type locality: SW of Cap Manuel, Dakar area (Senegal), 80–250 m.

Material examined: Mauritania: "Ndiago" sta. 243 (17°48′N, 16°32′W), 200 m, 1 shell (2.4×1.35 mm), coll. Richer de Forges 1981. Senegal: Type material and S. of Gorée 110–112 m, 3 shells (2.25×1.3 to 2.35×1.35 mm), coll. Marche-Marchad; South of Dakar (14°35′N,

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Figures 43–47. *Alvania marchadi* new species. **43.** Shell (holotype) from off SW of Cap Manuel (Senegal), shell length 2.7 mm. **44.** Shell (paratype), from the type locality, shell length 2.5 mm. **45.** Protoconch of the paratype fig. 44. Scale bar = 100 μm. **46.** Detail of the microsculpture on a teleoconch whorl of the same specimen. Scale bar = 50 μm. **47.** Shell from off Sidi Ifni (Morocco), shell length 2.7 mm.
Figures 48–49. *Alvania subareolata* (Monterosato, 1869). **48.** Specimen from off Linosa (Sicily channel), shell length 1.9 mm. **49.** Protoconch of the same specimen. Scale bar = 100 μm.
Figures 50–52. *Alvania richeri* new species. **50.** Holotype from off SW of Cap Manuel (Senegal), shell length 2.7 mm. **51.** Protoconch of the holotype. Scale bar = 100 μm. **52.** Detail of the microsculpture on a teleoconch whorl of the holotype. Scale bar = 50 μm.
Figures 53–56. *Alvania coseli* new species. **53.** Shell (holotype) from off Dakar (Senegal), shell length 2.75 mm. **54.** Paratype from the type locality, length 2.3 mm. **55.** Protoconch of the paratype fig. 54. Scale bar = 100 μm. **56.** Detail of the microsculpture on a teleoconch whorl of the same specimen. Scale bar = 50 μm.

17°35′W), 120 m, 1 shell (2.6×1.35 mm), coll. Leung Tak.

Habitat: On deeper part of shelf and upper part of slope, type of bottom unknown.

Distribution: Mauritania and Senegal.

Remarks: This species is extremely similar to and lives sympatrically with *A. marchadi*, a species with which it is easily confused. It is distinguished by absence of linear arrangement of minute granules on protoconch surface, which appears smooth under stereomicroscope. The teleoconch of *A. richeri* can be differentiated by the more distinct umbilical chink and by lack of an additional cord on shoulder of last whorls. It is also similar to *A. subarcolata*, but differs in its larger size, stouter profile with a swollen subsutural area, and blunt teleoconch sculpture.

The species is named after Bertrand Richer de Forges, marine biologist at ORSTOM (the French government's overseas research agency) and collector of most of the Mauritanian material studied here.

Alvania coscli new species
(Figures 53–56)

Type material: Holotype (shell 2.75×1.5 mm) and 7 paratypes (shells 2.3×1.4 to 2.8×1.55 mm), coll. Marche-Marchad. Paratypes (3 shells, 2.1×1.2 to 2.25×1.3 mm) from off Gorée 95 m, coll. Marche-Marchad (AMS).

Type locality: Dakar area, 95 m.

Material examined: Morocco: Off Sidi Ifni, "Cineca" sta. B33 (29°23′N, 10°50′W), 132 m, 3 shells (2.1×1.1 to 2.25×1.1 mm), coll. Glémarec 1972. Mauritania: "N'Diago" sta. 118 (18°36', 16°31′W), 96 m, 1 shell (2.35×1.3 mm); "N'Diago" sta. 119 (18°36', 16°28′W), 70 m, 4 shells (2.45×1.3 to 2.7×1.4 mm), coll. Richer de Forges 1981. Senegal (coll. Marche-Marchad): Type material and S of Gorée 110–112 m, 14 shells (2.1×1.25 to 2.6×1.4 mm); Off Gorée 50 m, 1 shell (2.2×1.3 mm); Dakar area (14°32', 17°25′W), 50 m, 1 shell (2.25×1.3 mm); Off Gorée, sta. 56–1–10A, 150–200 m, 1 shell (2.5×1.35 mm).

Description: Shell high, conical, solid, adults 2.1×1.2 mm to 2.75×1.55 mm. Protoconch with 1.3–1.5 convex whorls, globose; surface with 7 spiral flat cords, as broad as interspaces, formed by minute granules visible only under high magnification. Teleoconch with 4 whorls; spire whorls convex, with widely spaced, nearly vertical axial folds (ca. 16–18 on penultimate whorl) and spiral cords narrower than interspaces, superimposed on axial folds; 4 cords on first and second teleoconch whorl, adapical one bordering suture. Body whorl rounded, with 12–13 quite even spiral cords and axial folds gradually fading toward periumbilical area. Teleoconch whorls with extremely fine spiral microsculpture of widely spaced granulose threads. Outer lip slightly opisthocline, externally thickened by very strong rim strongly differentiated from adjacent external shell surface; superimposed by spiral cords, which continue, very attenuated, on its outer surface; inner surface smooth. Inner lip slightly thickened, leaving distinct umbilical chink. Shell white.

Habitat: On deeper part of shelf and upper part of slope, type of bottom unknown, often found together with *A. marchadi* and *A. richeri*.

Distribution: From the coast of Sahara to Senegal.

Etymology: The species is named after Rudo von Cosel, as a tribute to his contributions to West African malacology.

Remarks: This species shares with *A. subarcolata*, *A. marchadi*, and *A. richeri* the general outline, vertical axial ribs, teleoconch microsculpture and the very peculiar microsculpture of closely arranged granules on the protoconch. Based on these shell characters, these species are provisionally considered to belong to a monophyletic group. *Alvania coscli* is distinguished from these species by having about twice as many spiral cords.

Genus *Crisilla* Monterosato, 1917

Type species: *Turbo semistriatus* Montagu, 1808, by monotypy.

Crisilla transitoria new species
(Figures 57–61)

Description: Shell conical, slightly cyrtoconoid, moderately solid, adults 1.40×0.85 mm to 2.25×1.35 mm. Protoconch with 2.3–2.7 whorls, first one depressed, giving spire slightly cyrtoconoid profile; with spiral lines of tiny granules, well-defined on first whorl, becoming loosely arranged on second whorl, again well-defined on last larval whorl. Teleoconch with 2.2–3.0 whorls; spire whorls slightly convex, with moderately developed, tightly arranged axial folds (ca. 35 on penultimate whorl) and spiral cords; 2 subsutural and suprasutural cords stronger; remaining (2 on first teleoconch whorl, 5 on penultimate) weak and not superimposed on axial folds. Body whorl rounded, slightly constricted, with 18–20 spiral cords and axial folds gradually fading toward periumbilical area. Outer lip orthocline, smooth inner surface, slightly thickened externally at some distance from sharp edge. Inner lip thin, bordering tiny umbilical chink. Shell color buff, with 1 row of large, square subsutural brown patches; 1 row of smaller suprasutural brown patches, which continues on body whorl, and spiral rows of smaller patches on periumbilical area.

Head-foot semitransparent, whitish with triangular, opaque yellow patches behind eyes, and interrupted yellow bars on tentacles. Foot with distinct anterior pedal gland and cluster of 3 small metapodial tentacles; 2 small, colorless pallial tentacles.

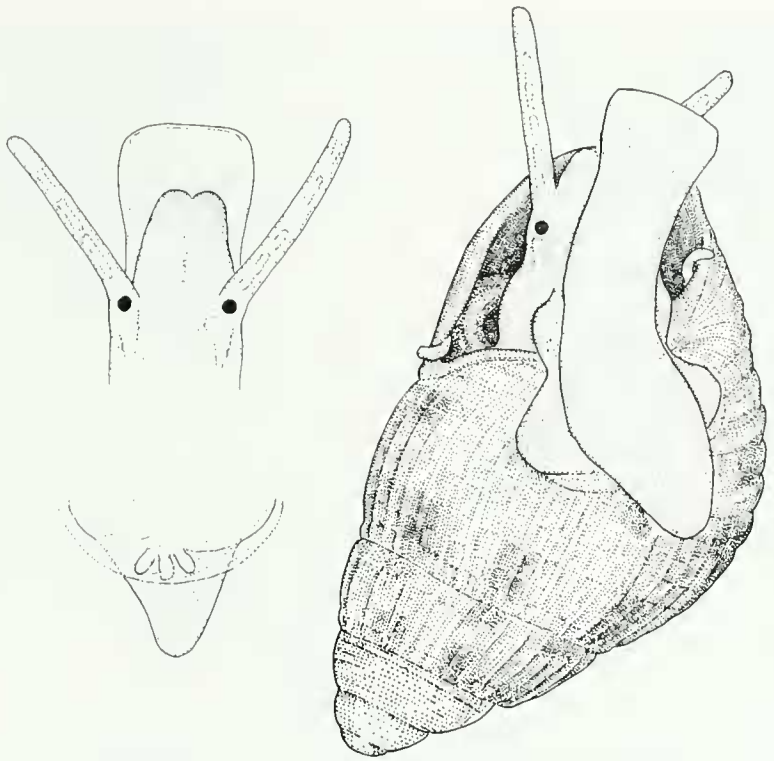


Figure 57. *Crisilla transitoria* new species. Living animal (paratype) from Palmeirinhas (Angola), shell length 1.8 mm.

Type material: Holotype (specimen 1.8×1.1 mm) and 5 paratypes (specimen 1.65×1.1 to 2.1×1.3 mm) from type locality (MNHN). Paratypes (6 specimens, 1.7×1.05 to 1.8×1.1 mm; living animal observed and drawn) from Palmeirinhas, Buraco, rocks in 2–3 m. Paratypes (5 specimens 1.65×1.1 to 1.9×1.2 mm) from type locality (AMS). Paratypes (5 specimens 1.65×1.05 to 1.95×1.2 mm) from type locality (UAN).

Type locality: Corimba, province of Luanda (Angola, 8°50′S, 13°09′E), on shell gravel, 10–20 m.

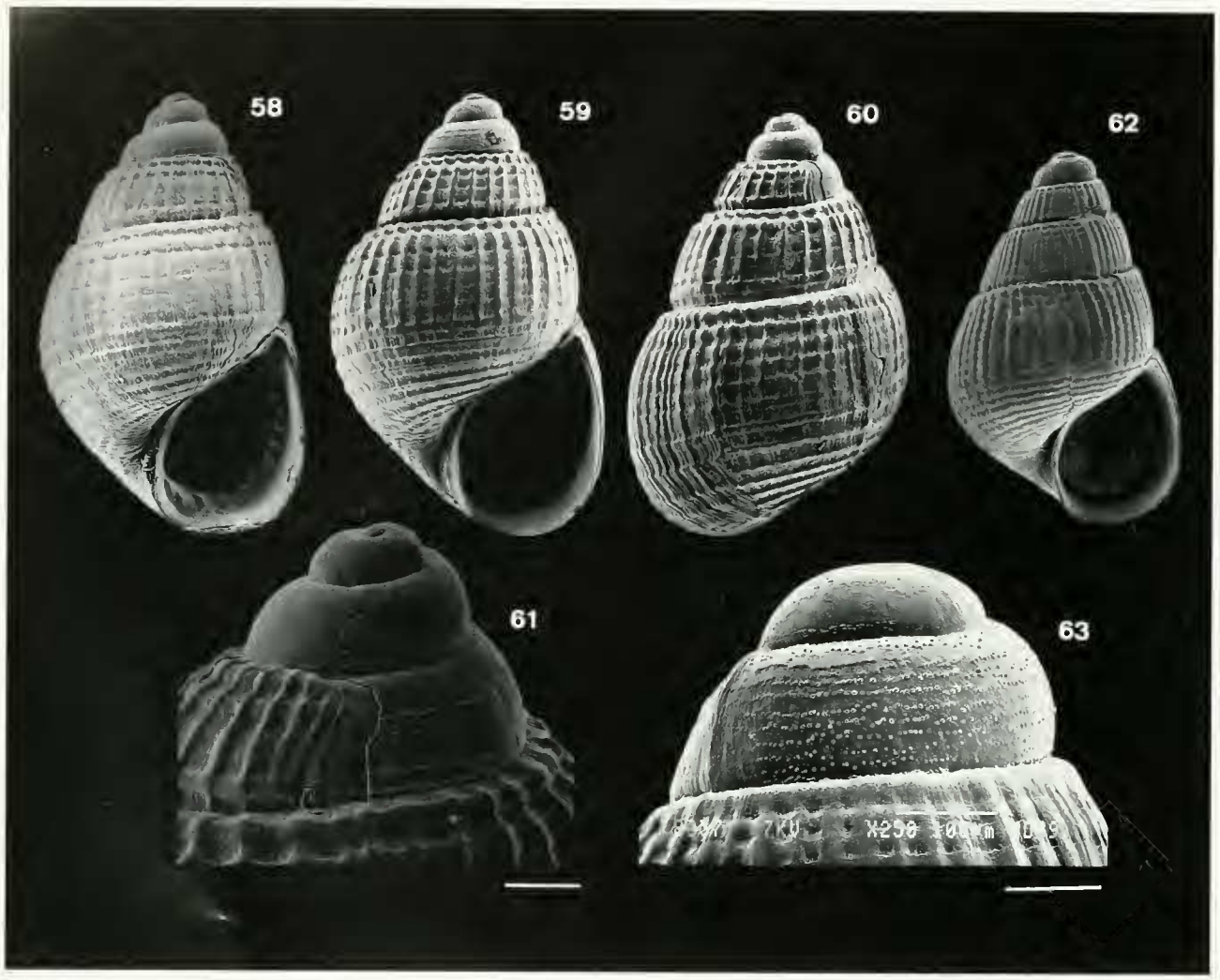
Material examined: Senegal (coll. Marche-Marchad): Off Saloum 50 m, 3 shells (1.75×1.15 to 2.0×1.2 mm); Baie de Gorée, S. of "Tacoma" shipwreck, 25 m, 1 juv shell; SW of Cap Manuel 50 m, 1 shell (1.85×1.15 mm); Casamance (12°46,9′N, 17°29,9′W), 1 shell (1.6×1.15 mm). São Tomé: Morro Peixe, 1 shell (1.85×1.1 mm); Mutamba near Neves, 1 shell (1.85×1.15 mm). Congo: Pointe Noire, Plage mondaine N of lighthouse, 5 shells (1.4×0.9 to 1.55×0.95 mm); Pointe Noire, Plage Orstom dredged 5–7 m, 1 specimen (1.8×1.15 mm), coll. von Cosel, Nov.–Dec. 1985. Angola (coll. Gofas): Type material and off Ambrizete 45 m, 14 shells (1.4×0.95 to 1.5×1.0 mm); Off Ambrizete 80 m, 20 shells (1.35×0.95 to 1.6×1.0 mm); Ambrizete Lighthouse, shore, 8 shells (1.5×0.9 to 1.9×1.2 mm); Barra do Dande, intertidal, 2 specimens + 3 shells (1.8×1.15 to 2.25×1.35 mm); Ilha de Luanda, dredged 40–60 m, 15 specimens + 20 shells (1.4×0.95 to 1.8×1.15 mm); Cabo Ledo, 10–40 m, rocks from tangle nets, 100+ specimens (1 dr.), mostly juvenile (1.75×1.15 mm to 1.50×1.00 mm); Off Mussulo 90–100 m, 15 specimens + 40 shells (1.3×0.9 to 2.2×1.25 mm); Chapéu Armado, intertidal, 30 specimens + 3 shells (1.5×0.85 to 1.65×0.95 mm); Baía das Pipas, intertidal, 1 shell (1.85×1.15 mm); São Nicolau, shore, 400 shells (1.5×0.9 to 2.0×1.2 mm); Praia Amélia, intertidal, 5 specimens (1.5×0.9 to 1.75×1 mm; living animal observed and drawn); Praia Amélia 2–5 m, 23 specimens (1.4×0.9 to 1.65×0.95 mm); Praia Amélia 40–60 m, 1 specimen + 15 shells (1.1×0.75 to 1.5×1 mm); S. of Ponta Albina, 6 shells (1.7×1.1 mm to 1.35×1 mm); Baía dos Tigres, low tide, 5 specimens + 3 shells (1.35×0.9 to 1.5×0.95 mm).

Habitat: Intertidal to outer shelf. On rocky or shell gravel bottom, in crevices percolated by seawater, or in coarse sediment.

Distribution: Senegal; from Congo to southernmost Angola; São Tomé.

Etymology: The specific epithet alludes to the general aspect of the shell, intermediate between typical *Crisilla* and *Alvania*.

Remarks: This species shares a number of characters with the type species of *Crisilla, C. semistriata* (Montagu, 1808). The two species show the same microsculpture on the multispiral protoconch (see Bouchet and Warén, 1993: fig. 1535, for a good illustration), same color pattern of square blotches, and stronger subsutural cords and furrows differentiated from the remainder of



Figures 58–61. *Crisilla transitoria* new species, from Angola. **58.** Paratype, from Palmeirinhas, shell length 1.8 mm. **59.** Holotype, from Corimba, shell length 1.8 mm. **60.** Paratype, from Corimba, shell length 1.75 mm. **61.** Protoconch of the paratype fig. 60. Scale bar = 100 μm.
Figures 62–63. *Crisilla fallax* new species. **62.** Holotype, from off Gorée, (Senegal), shell length 2.0 mm. **63.** Protoconch of a paratype. Scale bar = 100 μm.

whorl. It also lives in the same kind of habitat, in oxide-lined cavities under rocks that are not filled with sediment and through which seawater percolates. *Crisilla transitoria* is distinguished by a more cyrtoconoid profile, a lower spire, more definite axial folds, and presence of yellow stains on tentacles (colorless in *C. semistriata*).

Crisilla fallax new species
(Figures 62–63)

Description: Shell conical, moderately solid, adults 1.6×1.15 mm to 2.25×1.4 mm. Protoconch with 1.3–1.5 whorls, convex, with sculpture of minute granules arranged along spiral lines. Teleoconch with 3.0–3.2 whorls; spire whorls slightly convex, with moderately developed, tightly packed axial folds (ca. 35 on penultimate whorl) and spiral cords; 2 subsutural and 1 suprasutural cords stronger; remaining cords (2 on first teleoconch whorl, 5 on penultimate) weak and not superimposed on axial folds. Body whorl rounded, with 18–20 spiral cords and axial folds gradually fading towards periumbilical area. Outer lip orthocline, smooth inner surface, hardly thickened externally at some distance from edge, which is cutting. Inner lip thin, bordering tiny umbilical chink.

Shell color buff, with 1 row of large, square subsutural brown patches, 1 row of smaller suprasutural brown patches, which continues on body whorl, and spiral rows of smaller patches on periumbilical area.

Type material: Holotype (specimen 2.0×1.2 mm) and 14 paratypes (2 specimens 1.9×1.25 to 2.1×1.25 mm and 12 shells 1.6×1.15 to 2.05×1.25 mm) from type locality, coll. Marche-Marchad (MNHN).

Type locality: S of Gorée, Senegal, 110–112 m.

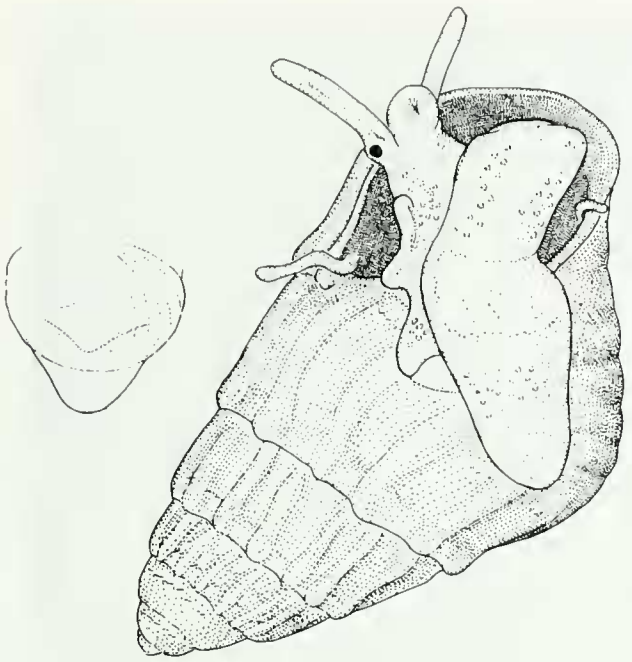


Figure 64. *Benthonellania gofasi* Lozouet, 1990, living specimen from off Mussulo (Angola), shell length 2.0 mm.

Material examined: Senegal: Type material and Dakar area, 95 m, 1 shell (2.25×1.4 mm), coll. Marche-Marchad.

Habitat: Outer shelf, type of bottom unknown.

Distribution: Known only from near type locality, off Senegal.

Etymology: The species name alludes to possible confusion with the other West African *Crisilla*.

Remarks: This species is very similar to *C. transitoria*, sharing with this latter the teleoconch sculpture and color; they differ, however, by the spire profile, which is higher and more regularly conical in *C. transitoria*, not cyrtoconoid, and by the number of teleoconch whorls, one more in *C. transitoria*. The essential diagnostic character is the paucispiral protoconch, which hints at one more case of a pair of similar species, with one species supposedly undergoing planktotrophic development, the other one undergoing non-planktotrophic development.

Genus *Benthonellania* Lozouet, 1990

Type species: *Benthonellania gofasi* Lozouet, 1990, by original designation.

Benthonellania gofasi Lozouet, 1990
(Figures 64–68)

Benthonellania gofasi Lozouet, 1990, p. 314–318, 322–324.

Description: Shell elongate, conical, slightly cyrtoconoid, rather thin, adults 2×1.2 to 2.8×1.6 mm. Protoconch with 2.1–2.4 convex whorls, with irregular spiral threads from which short oblique lines branch-off, forming loosely reticulate pattern; last protoconch whorl with broad smooth spiral zones. Teleoconch with 3–3.5 whorls; spire whorls rather flat with swollen subsutural rim and strong, slightly sinuous axial folds (ca. 20 on first teleoconch whorl, 10–12 on penultimate whorl) terminating adapically by bulge on subsutural rim. Body whorl rounded, with axial folds fading toward periumbilical area, and gradually replaced there by blunt spiral rims. Outer lip not thickened, orthocline. Inner lip thin, leaving small umbilical chink.

Head-foot semitransparent, whitish with tiny opaque white flecks, and poorly defined axial opaque white bar on tentacles. Distinct neck lobe on right side between head and opercular lobe, not present on left side. Snout rather small and cylindrical, with yellow buccal mass visible by transparency. Foot with broad and flat metapodium and very conspicuous, opaque white posterior pedal gland and 1 cluster of small white flecks on propodium sole, and another such cluster on metapodium; no metapodial tentacles. Pallial tentacles slender, colorless, with parallel sides, right one quite conspicuous, left one very small.

Type material: Holotype (specimen 2.15×1.2 mm) and 20 paratypes (MNHN); 2 paratypes (AMS).

Type locality: SW of Cap Manuel, Senegal, 250 m.

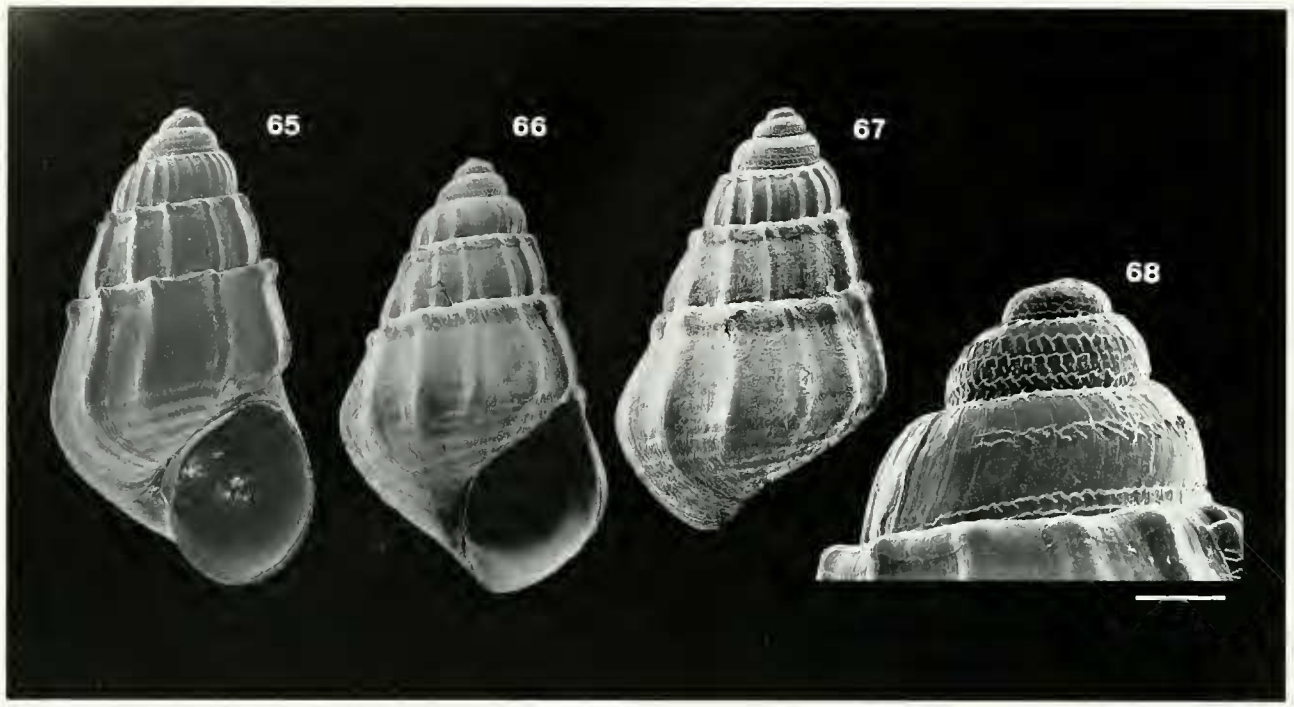
Material examined: Mauritania (coll. Richer de Forges 1981): "N'Diago" sta. 222 (17°42′N, 16°34′W), 200 m, 1 specimen + 1 shell (2.2×1.25 to 2.5×1.4 mm); "N'diago" sta. 243 (17°48′ N, 16°32′W), 200 m, 12 shells (2.0×1.25 to 2.3×1.35 mm); "N'Diago" sta. 244 (17°54′N, 16°32′W), 1 specimen; "Ernst Haeckel" sta. CH268, (18°46′N, 16°51′W), 610 m, 7 shells (1.55×1.0 to 1.7×1.05 mm). Senegal: Off M'Bour, 246 m, 130 specimens (2.2×1.35 to 2.8×1.6 mm), coll. Pin; Dakar area sta. 55–6–3D (14°19′N, 17°23′W), 78 m, 4 specimens, coll. Marche-Marchad; Off Gorée 80–250 m, 9 shells, coll. Marche-Marchad; South of Dakar sta. L4 (14°35′N, 17°35′W), 120 m, 4 shells, (1.9×1.2 to 2.1×1.25 mm), coll. Leung Tak. Angola: Off Ilha de Luanda, 120 m, 140 specimens (mostly juveniles, adults 1.65×1.0 to 2.05×1.25 mm), coll. Gofas.

Habitat: On muddy bottoms of lower shelf and upper slope.

Distribution: From off Essaouira, Southern Morocco (Monaco sta. 1116 cited by Bouchet and Warén, 1993) to Angola. Bouchet and Warén (1993) mentioned its occurrence off Madeira, but did not refer to any record in particular.

Genus *Obtusella* Cossmann, 1921 ex-Monterosato ms.
(new name for *Cingulina* Monterosato, 1884,
preoccupied by *Cingulina* H. and A. Adams, 1860)

Type species: *Rissoa obtusa* Cantraine, 1842 (preoccupied by *R. obtusa* Brown, 1841; = *Rissoa intersecta* Wood, 1857



Figures 65–68. *Benthonellania gofasi* Lozouet, 1990. **65.** Holotype, from off Cap Manuel (Senegal), shell length 2.15 mm. **66–67.** Specimen from off Mussulo (Angola), same as fig. 64, shell length 2.0 mm. **68.** Protoconch of a juvenile specimen from the same locality. Scale bar = 100 μm.

Obtusella intersecta (Wood, 1857)
(Figure 11)

Rissoa obtusa Cantraine, 1842: 348 (preoccupied).
Rissoa soluta (not of Philippi, 1844) sensu Forbes and Hanley, 1850: 131, pl. 75 fig. 3–4.
Rissoa intersecta Wood S.V., 1857: 318 (based on *Rissoa soluta* sensu Forbes and Hanley 1850).
Putilla (Obtusella) cantrainei Nordsieck, 1972, replacement name for *R. obtusa* Cantraine, 1842).

Type locality: "British".

Material examined: Western Europe and Morocco: several hundred specimens from throughout the range. Senegal: Off Saloum 50 m, 4 shells (0.9×0.7 to 1.15×0.8 mm), coll. Marche-Marchad. Angola (coll. Gofas): Ambrizete 45 m, 6 shells (0.6×0.5 to 0.8×0.6 mm); Ambrizete 80 m, 40 shells (0.8×0.6 to 1.1×0.7 mm); Off Ilha de Luanda, dredged 40–60 m, 5 specimens + 44 shells (0.6×0.5 to 0.85×0.7 mm); Off Ilha de Luanda 120 m, 40 shells (0.6×0.5 to 0.8×0.65 mm); Off Mussulo 90 m, 150 shells (0.75×0.6 to 1.05×0.75 mm); Off Mussulo 50–70 m (Macoco), 40 shells (0.70×0.60 to 0.90×0.70 mm), Off Praia Amélia, 40–60 m, 20 shells (0.85×0.7 to 1.0×0.75 mm).

Description: Shell conical, somewhat cyrtoconoid; adults 0.8×0.6 to 1.15×0.8 mm. Protoconch of 2 whorls, apical one depressed, regularly convex with spiral thread adapically next to suture. Teleoconch of 1.7 to 2 whorls; spire whorls quite convex, regularly increasing in size, sculptured with faint, uneven spiral cords (9–12 on penultimate whorl); body whorl rounded with spiral lines continued all over. Aperture pyriform; outer lip orthocline, smooth inner surface, not thickened. Inner lip thin, bordering narrow umbilicus. Shell color buff, uniform.

Habitat: On soft bottoms (muddy sand or mud) of continental shelf, usually between 50 and 200 m.

Distribution: From Northern Norway, the Faroes, southwestern and southern Iceland, to Mediterranean (Bouchet and Warén, 1993), and in West Africa south to southernmost Angola at least.

Remarks: The range of this species is surprisingly large, but there are no morphological or ecological grounds on which the West African populations could be distinguished.

Subfamily **Rissoininae** Stimpson, 1865

Genus *Rissoina* d'Orbigny, 1840

Type species: *Rissoina inca* d'Orbigny, 1840, by original designation.

Rissoina punctostriata (Talavera, 1975)
(Figures 69–73)

Zebina punctostriata Talavera, 1975: 3; pl. 1 fig. 1; pl. 4 fig. 7.

Description: Shell elongate, conical, solid, adults

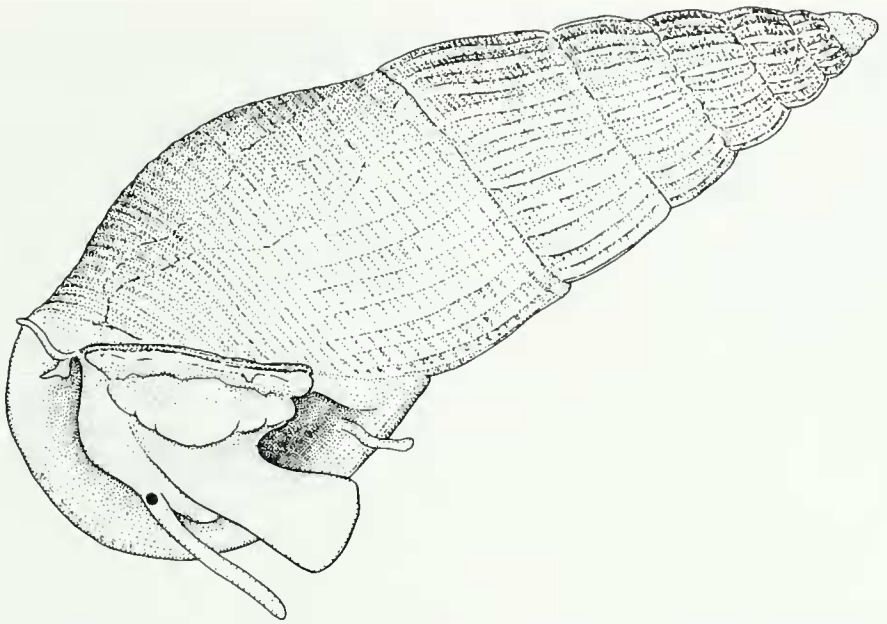


Figure 69. *Rissoina punctostriata* (Talavera, 1975), living specimen from Caotinha (Angola), shell length 7.45 mm.

5.2×2.1 to 8.9×3.5 mm. Protoconch with 2.8–3.2 convex whorls, smooth with spiral thread running adapically along suture of first and second whorl; protoconch/teleoconch transition well-defined, with very deep adapical notch bordered by thickened rim (indicating position of velar lobes during veliger larval stage). Teleoconch with 6–7 whorls, first 2 with strong shoulder, next one becoming gradually slightly convex; body whorl rounded abapically. Surface with oblique axial ribs (ca. 30 on penultimate whorl, becoming more numerous but less distinct on body whorl), and composite spiral microsculpture of uneven spiral threads superimposed by spiral microstriae.

Aperture pyriform, deeply channelled at insertion of outer lip on previous whorl. Outer lip opisthocline, thickened but not demarcated from body whorl; inner surface smooth, meeting external sculptured surface along sharp line. Inner lip slightly thickened, appressed.

Head-foot colorless, with faint brownish hue at tip of snout. Tentacles with parallel sides, slender; eyes at base of tentacles. Snout elongate, markedly with two lobes, with pink buccal mass visible by transparency. Metapodial tentacle hardly visible. Sole of foot colorless, with pedal gland inconspicuous. One small, slender pallial tentacle on right side of aperture; 2 contiguous tentacles on left side, of which innermost is smaller and stouter.

Type material (not seen): Holotype, shell from SAHMAS 1 cruise, sta. EO 8, now in Museo de Ciencias Naturales, Tenerife, TFMC 317 (MO) (F.G. Talavera, pers. comm. 1997).

Type locality: Off Mauritania (18°20′N, 16°10′W), 70 m.

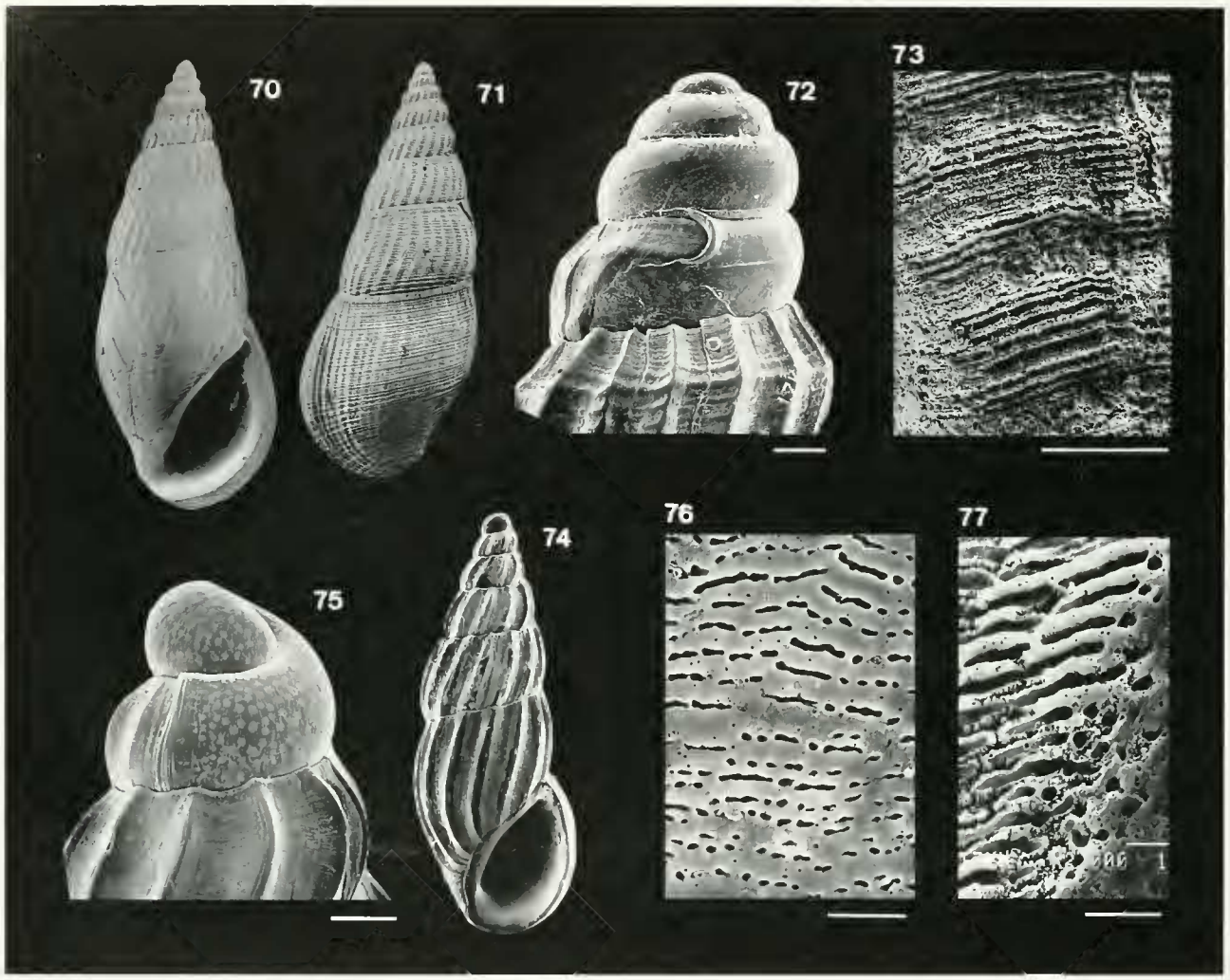
Material examined: Sénégal: Baie de Gorée, 20–30 m, 4 shells (8.3×3.4 to 8.9×3.5 mm), coll. Pin. Côte d'Ivoire: 22 shells (4.25×1.65 to 4.65×1.9 mm). São Tomé: Esprainha, 0–4 m, 2 shells (4.85×2.05 to 6.5×2.6 mm). Gabon: Cap Santa Clara 1–2 m, 3 specimens + 1 shell (7.75×3.2 mm). Cameroun: sta. CC40, (4°04,5 N, 8°42′E), 61 m, 1 shell (5.75×2.45 mm) coll. Monteillet. Angola (coll. Gofas): Off Ambrizete 80 m, 4 juvenile shells; Corimba, rocks with sand 0–1 m, 3 shells (7.4×3.05 to 8.5×3.35); Corimba on sand bar 10–20 m, 10 shells (6.00×2.45 to 6.75×2.8 mm). Palmeirinhas (Buraco), 0–2 m, 1 shell (5.25×2.15 mm); Palmeirinhas 30 m, rocks, 1 shell (5.4×2.3 mm); Off Mussulo 90–100 m, 4 juvenile shells; Caotinha, 1 specimen (7.45×3.05 mm; living animal observed and drawn); Santa Maria, 2 shells (7.25×3.1 to 8.65×3.6 mm); Lucira (Cesar), 10 m, 1 shell (7.25×3.15 mm); Chapéu Armado, 1 specimen (5.55×3.6 mm, broken apex).

Habitat: Under stones among coarse sand and rubble on rocky bottoms, subtidal.

Distribution: West African coast from Western Sahara to Angola; São Tomé; Cape Verde Islands.

Remarks: This species was described from a West African specimen as *Zebina punctostriata* by Talavera (1975), but was later (Garcia-Talavera, 1982) synonymized with the West Indian species *Rissoina decussata* (Montagu, 1803).

The multispiral larval shell, with deep notches for velar lobes, indicates planktotrophic development for both species. However, it can be questioned whether the small larvae of *Rissoina* can routinely cross the Atlantic. *R. decussata* has a more cylindrical protoconch than *R. punctostriata* from Angola or Cape Verde Islands, and lacks the shoulder on the very early teleoconch whorls



Figures 70–73. *Rissoina punctostriata* (Talavera, 1975). **70–71.** Specimen from Caotinha (Angola), same as fig. 69, shell length 7.45 mm. **72.** Protoconch of a juvenile specimen from Caotinha. Scale bar = 100 μm. **73.** Detail of the microsculpture on a teleoconch whorl, same specimen as figs 70–71. Scale bar = 50 μm.
Figures 74–77. *Schwartziella africana* (Dautzenberg, 1913). **74.** Specimen from Dakar (Senegal), shell length 3.2 mm. **75.** Protoconch of another specimen from the same locality. Scale bar = 100 μm. **76–77.** Details of microsculpture of the teleoconch whorls on unaltered (76) and on partially eroded (77) surfaces, same specimen as fig. 74. Scale bars = 10 μm.

(A.A. Luque, pers. comm. 1999); these morphological differences support holding them as separate species.

The distribution of *R. punctostriata* is spotty and the species is usually rare, a pattern of occurrence which is usual in species featuring long-ranging planktotrophic larvae. The population examined from Côte d'Ivoire consists of old, worn shells, possibly subfossil, and differs markedly in having strong axial sculpture, with few strong ribs, thus superficially resembling *Schwartziella africana*. The protoconch is similar to that illustrated in fig. 72.

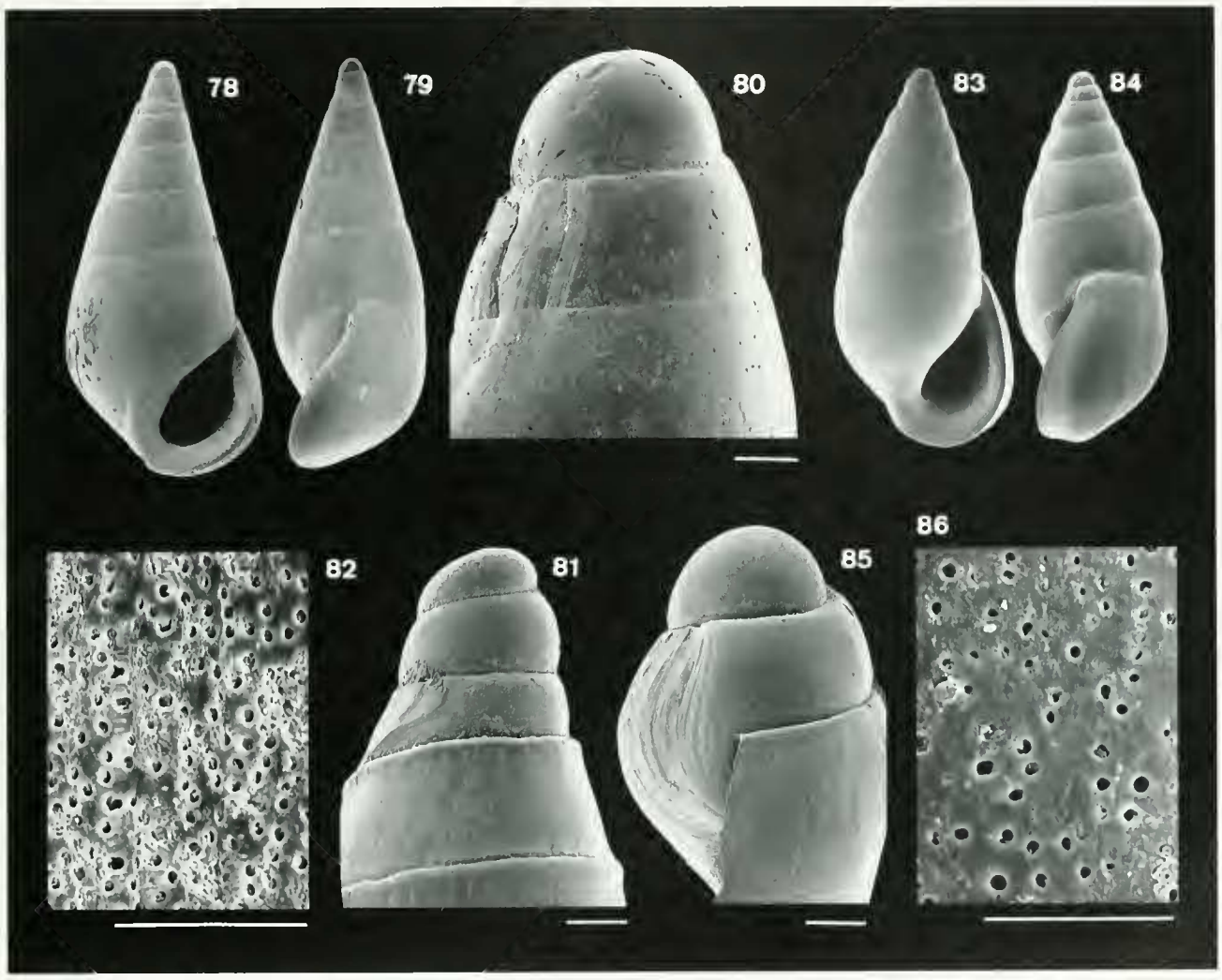
Genus *Schwartziella* Nevill, 1881

Type species: *Rissoina orientalis* Nevill, 1881 (= ? *Rissoina triticea* Pease, 1861), by original designation.

Schwartziella africana (Dautzenberg, 1913)
(Figures 74–77)

Rissoina africana Dautzenberg, 1913: 48–49, pl. 2 fig. 5–6.
Rissoina africana var. *crassior* Dautzenberg, 1913: 49, pl. 2 fig. 7–8.

Description: Shell very high conical, solid, 2.5×1.1 to 5.25×2.15 mm. Protoconch with 1.1–1.3 convex whorls, evenly covered with rounded smeared spots; protoconch/teleoconch transition well defined. Teleoconch with 5–6.5 convex whorls; body whorl broadly rounded abapically. Surface with strong, oblique, slightly sinuous axial ribs (ca. 12 on body whorl), and complex spiral microsculpture of lines of pores and slits, or of irregular striae when eroded (these latter representing underlying structure). Aperture pyriform, not channelled at inser-



Figures 78–80. *Zebina robustior* new species, from Senegal. **78–79.** Shell (holotype) from off Dakar, shell length 5.1 mm. **80.** Protoconch of another specimen from off SW Gorée. Scale bar = 100 μm
Figures 81–82. *Zebina browniana* (d'Orbigny, 1842) from Santiago de Cuba, Ensenada de Nispero. **81.** Protoconch. Scale bar = 100 μm. **82.** Detail of the microsculpture on a teleoconch whorl. Scale bar = 10 μm.
Figures 83–86. *Zebina paivensis* (Watson, 1873). **83–84.** Specimen from Selvagens Islands, shell length 3.9 mm. **85.** Protoconch of a juvenile specimen from the same locality. Scale bar = 100 μm. **86.** Detail of the microsculpture on a teleoconch whorl. Scale bar = 10 μm, same specimen as figs 83–84.

tion of outer lip on previous whorl. Outer lip slightly opisthocline, thickened but not differentiated from body whorl; inner surface smooth, meeting external sculptured surface along sharp line. Inner lip slightly thickened, appressed.

Type material: Figured syntype of *R. africana* (shell, 3.1×1.35 mm), here designated as lectotype (MNHN); figured syntype of *R. africana* var. *crassior* (3.05×1.4 mm), here designated as lectotype (MNHN).

Type locality: Pointe de Bel-Air (baie de Hann), Dakar (Senegal), intertidal.

Material examined: Senegal: Off Salomm 50 m, sta. 55.3.9, 2 shells (4.9×2 to 5.0×1.9 mm); Dakar 5563D, 3 shells (3.25×1.2 mm), coll. Marche Marchad; Dakar, 10 shells (3.25×1.2 to 3.45×1.45 mm), Staadt collection, MNHN; Joal, 10 shells (3.5×1.45 mm), coll. Mauny; Yoff, intertidal under stones, 5 specimens (2.55×1.15 to 2.85×1.25 mm), coll. Bouchet; Baie de Gorée 50 m, 1 shell (5.25×2.15 mm), coll. Marche Marchad; Baie de Gorée 50 m, 1 shell (5.25×2.1 mm), coll. Marche Marchad; Bel Air, towards "Tacoma" shipwreck, 2 shells (3.15×1.3 to 3.45×1.4 mm); Dakar area, 32 specimens with rusty crust (2.95×1.15 to 3.5×1.4 mm); Baie de Gorée 15 m, 15 specimens (3.15×1.4 to 3.4×1.45 mm), coll. Marche Marchad; Dakar area (14°29′N, 17°23′W), 21 m, 4 shells. Cape Verde Islands: "Sylvana" sta. 136, Maio island, 1 shell (3.45×1.45 mm).

Habitat: Intertidal or shallow subtidal, under rocks.

Distribution: Known with certainty only from a small

stretch of coastline around Dakar, Senegal. The record from Cape Verde Islands is probably based on a mislabeled specimen, as this species was not met with in a large material of *Rissoina* from this archipelago examined by A. A. Luque and E. Rolán (pers. comm., 1999).

Genus *Zebina* H. and A. Adams, 1854

Type species: *Rissoina semiglabrata* A.Adams, 1854 (= ? *Rissoa tridentata* Michaud, 1830), by subsequent designation, Rehder, 1980.

Zebina robustior new species (Figures 78–80)

Description: Shell elongate, conical, solid, glossy, 4.1×1.9 to 5.3×2.4 mm. Protoconch with 1.2 whorls, very globose, smooth. Teleoconch with 6 whorls, spire whorls straight, body whorl rounded abapically. Surface apparently smooth, with scarce tiny punctures visible only under very high magnification. Aperture pyriform, channelled at insertion of outer lip on previons whorl. Outer lip very strongly opisthocline, thickened but not differentiated from body whorl, with rounded edge. Inner surface of outer lip with 2 slightly swollen sections separated by central depression. Inner lip strongly thickened, appressed.

Type material: Holotype (5.1×2.4 mm) from type locality, coll. Marche Marchad, sta. 55–6–3D (MNHN).

Type locality: Off Dakar, Senegal, 14°19′N, 17°23′W, 78 m.

Material examined: Morocco: "Vanneau" sta. 110 (30°23′N, 09°54′W), 110 m, 6 old shells. Mauritania: "Ndiago" sta. 116, 210 m, 1 shell (4.85×2.15 mm), coll. Richer de Forges 1981. Senegal (coll. Marche-Marchad): SW Gorée 150–200 m, 7 (4 juvenile) shells (4.1×1.9 to 4.15×2.0 mm); Off Gorée 50 m, 2 shells; Off Gorée 50 m, sta. 55–7–5A (14°32′N, 17°25,5′W), 1 shell (5.3×2.4 mm); SW Cap Manuel, 2 juvenile shells.

Habitat: Continental shelf.

Distribution: From Southern Morocco to Senegal.

Etymology: The specific epithet alludes to the sturdy, robust shell.

Remarks: This species resembles *Zebina paivensis* (Watson, 1873), a species commonly found on the shores of the Canary Islands and Selvagens, and which authors (Odhner, 1931; Nordsieck, 1972; Garcia-Talavera, 1982) have identified as the West Indian *Zebina browniana* (d'Orbigny, 1842) or *Zebina vitrea* (C.B. Adams, 1850). The Macaronesian populations resemble the Caribbean ones, but differ in having paucispiral instead of multispiral protoconchs, and in having different surface microsculpture. I illustrate here (Figs 81–82) these details from a specimen of Z. *browniana* originating from the same lot as the shell illustrated by Desjardin (1949: pl. 10 fig. 4).

Zebina paivensis has been originally introduced by Watson (1873: 364–365; pl. 36 fig. 29) as *Eulima paivensis*, and was overlooked since then. Its type locality is the coast of the Selvagens, where it is extremely common. I figure (figures 83–86) some topotypes for comparison.

Zebina robustior differs from Z. *paivensis* in being larger, having a strighter profile of spire and whorls and a more globose apex. It is an outer shelf species, in contrast with Z. *paivensis*, which inhabits in beach gravel on the lower intertidal zone of rocky shores.

DISCUSSION

There is apparently very little in common between the West African rissoids group and those from Western Europe and Morocco. The 2 shared species (*Pusillina inconspicua* and *Obtusella intersecta*) belong to genera in which species-level systematics is still confused and where further research may reveal species complexes where 1 single taxon is now recognized.

The *Rissoa* and *Setia* radiations, important in the Mediterranean and still quite well represented in Morocco and in the Canaries, are virtually absent in West Africa. The only representation is the citation of *Rissoa similis* Scacchi, 1836 in Port-Etienne (now Nouadhibou, at the extreme north of the West African province) by Dautzenberg (1913), which is correct but marginal to the West African province. *Rissoa* and *Setia* encompass species that live on algae or marine phanerogams on shallow rocky bottoms. Some lineages in the genus *Alvania*, including species such as the Mediterranean *A. scabra* Philippi, 1836 and *A. discors* (Allan, 1818), which usually live among the photophilous algae, are also apparently absent in West Africa. Most species described herein live either in cavities of rocky substrates, or on outer shelf soft bottoms, and their European relatives, where known, have also the same kind of habitat. This trend may be related to the scarcity of rocky shores suitable for the development of the community of photophilous algae, in most of tropical West Africa. However, it is not explained for Southern Angola where shallow marine environments resemble very much temperate Europe, but where Barleeidae clearly outnumber Rissoidae on the rocky shore (Gofas, 1995).

There are 4 pairs of species with planktotrophic development, and with respectively West African and West European nonoverlapping ranges. These are:

Alvania africana/A. beani
Alvania marioi/A. cancellata
Alvania gofasi/A. zetlandica
Crisilla transitoria/C. semistriata

Each one of these species pairs occupies similar habitats and shares similar conchological characters, which suggest that they are closely related. This is in contrast to the usual concept of local radiations where loss of planktotrophy has accompanied, or induced, local dif-

ferentiation. In this case, it is surprising that species with good dispersal ability have not persisted as single panmictic units. A possible scenario is that a single widespread species has been disrupted when increasing North/South climatic contrast has rendered impossible the existence of an extensive latitudinal range, leading the species to either be extinct on part of its range or to split up. This scenario (Endler, 1977) implies that selective pressure induced by changing environmental conditions may lead to discontinuous character distribution and, eventually, speciation along formerly large geographic ranges. This model has been invoked to explain speciation events in planktic species (Pierrot-Bults and van der Spoel, 1979). The model fits with the distributional data of the 4 species pairs mentioned above. Two other species (*Pusillina inconspicua* and *Obtusella intersecta*) with planktotrophic larvae have apparently maintained their large, all-inclusive tropical and temperate range.

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